AVIATION

The Oldest American Aeronautical Magazine

DECEMBER 6, 1926 Issued Weekly PRICE 15 CENTS

The Los Angeles moored to the Ford mast at Dearborn, Mich.

(c) Kalec and Foster

VOLUME XXI

NUMBER 23

SPECIAL FEATURES

ANNUAL REPORT OF THE CHIEF OF AIR CORPS
AMERICA AND AIR TRANSPORT
DO AIRPLANE ENGINES COST MUCH?

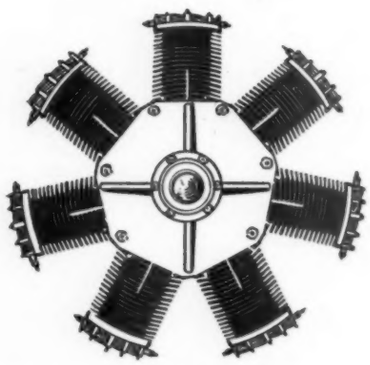
GARDNER PUBLISHING CO., INC.
HIGHLAND, N. Y.
225 FOURTH AVENUE, NEW YORK

Entered as Second-Class Matter, Nov. 22, 1920, at the Post Office, at Highland, N. Y. under Act of March 3, 1879.

The Bull's Eye Engine

Hits the Bull's Eye of Commercial Aviation

Why This Engine Will Interest *You*



An engine designed and built solely for commercial use. Constructed with the closest adherence to specification for material as laid down by military engineers, and incorporating the three outstanding and fundamental requirements of commercial aviation—*Power - Economy - Simplicity.*

Power

140 horse power at 1850 RPM and weighing only 325 pounds!

Economy

Tests of over 700 hours have set the gasoline consumption at less than 8 gallons of Aviation Gasoline per hour!

Simplicity

And last but not least the simplicity of this engine will impress the most exacting pilot. Possessing an "L" type head, eliminating troublesome overhead mechanism and making possible a valve grind in less than 20 minutes per cylinder, by simply removing the cylinder head. A two piece crank shaft with solid master rod bearings of exceptional large surface. Three piece crank case with all ground joints and many other features, which combined result in an engine that it is possible to disassemble and reassemble in *less than four hours!*

KLAMATH AIR SERVICE COMPANY

SOLE DISTRIBUTORS FOR WATERHOUSE AIRCRAFT CORP.

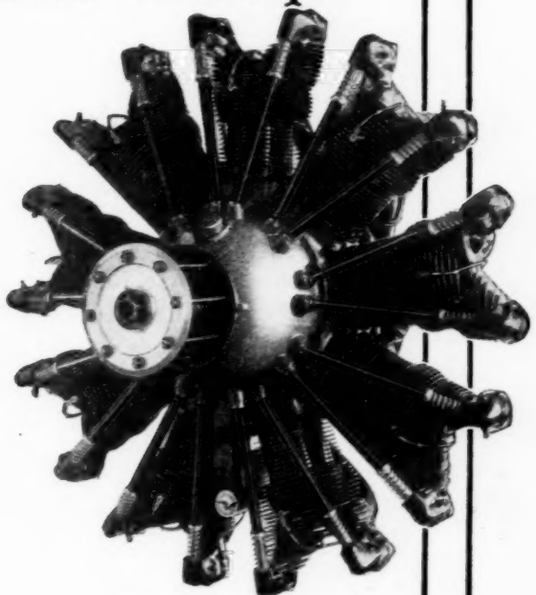
MAIN OFFICE:

CORNING, CALIF. ~ KLAMATH FALLS, OREGON ~ GLENDALE, CALIF.

The Home of the "Wasp"

These splendid facilities stand squarely behind the production of "Wasp" engines. Situated in the very center of the finest manufacturing district of New England, there is assured the skilled workmanship so essential for this work.

Into every engine is built the qualities which make for the fine performance and dependability so vital in both military and commercial flying.



425 H.P. at 1900 R.P.M.
Weight 650 lbs.

THE
PRATT & WHITNEY AIRCRAFT CO.
HARTFORD CONNECTICUT

LANDING FACILITIES — MUNICIPAL FIELD AND CONNECTICUT RIVER — ON AIRWAYS MAPS

Winter Flying

With the approach of winter, the aviator's hazardous calling becomes even more dangerous. His motor, upon whose perfect performance his safety depends, must operate under the handicap of intense cold. And if his motor fails, his landing is made doubly dangerous by the snow, which may hide holes and irregularities of the ground.

The performance of the aeroplane motor in cold weather depends upon the quality of the fuel that is burned in it, and the oil with which it is lubricated.

The great majority of flyers in the Middle West use

Stanolind Aviation Gasoline and Aero Oils

They have found by experience that these high quality products will bring out the best performance of the motor even under the most adverse conditions.

Stanolind Aviation Gasoline and Aero Oils are available at most landing fields throughout the Middle West. For a map showing the location of these fields, send for our Aviation Manual, which will be mailed free.

STANDARD OIL COMPANY
(Indiana)
General Offices: 910 S. Michigan Ave.
Chicago

THE

ADVANCE AIRCRAFT CO.

LARGEST PRODUCERS OF COMMERCIAL AIRCRAFT IN AMERICA ANNOUNCE

PRICE REDUCTION

ON THE IMPROVED

WACO-9

THREE-SEATER

$2250.

AT TROY, OHIO

More WACO'S are now in service for profit and pleasure than all other planes now in production in America.

THE PERFORMANCE MADE THE DEMAND

Write for Details

THE ADVANCE AIRCRAFT COMPANY
TROY, OHIO

Experience dating back to the infancy of the art of aviation

THE GLENN L. MARTIN COMPANY

Builders of Quality Aircraft Since 1909

CLEVELAND, OHIO

DECEMBER 6, 1926

AVIATION

VOL. XXI. NO. 23

Published every Monday

CONTENTS

Editorials	949	America and Air Transport	956
Annual Report of the Chief of Air Corps	950	The De Havilland Hercules Air Liner	958
Commerce Department Reports on Aviation	952	Do Airplane Engines Cost Much?	960
Secretary of War Reports on Aviation	953	Side Slips	968
The Fliers' Aspects of Aerography	954	Airports and Airways	969

GARDNER PUBLISHING COMPANY, Inc., *Publishers*

BUSINESS AND EDITORIAL OFFICES: 225 FOURTH AVENUE, NEW YORK
CABLE ADDRESS: AEROENG
Publication Office
HIGHLAND, N. Y.

Subscription price: Four dollars per year. Canada, five dollars. Foreign, six dollars. Single copies, fifteen cents. Back numbers 25 cents. *Copyright 1926, by the Gardner Publishing Company.*

Issued every Monday. Forms close ten days previously. Entered as second-class matter Nov. 22, 1920, at the Post Office at Highland, N. Y., under act of March 3, 1879.

THE BOEING FB-3 PURSUIT PLANE
WINNER OF THE FREE-FOR-ALL PURSUIT RACE, 1926 NATIONAL AIR RACES
Powered with Packard 600 h.p. Engine
Equipped with

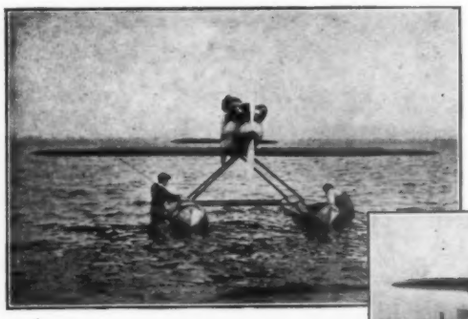
SCINTILLA

AIRCRAFT MAGNETOS

SCINTILLA MAGNETO COMPANY, INC.

Contractors to the U. S. Army and Navy. SIDNEY, NEW YORK

THE SCHNEIDER CUP RACE



800 H.P. MACCHI RACING SEAPLANE
Curtiss-Reed Propeller (Reed Design)

700 H.P. CURTISS RACING SEAPLANE
Curtiss-Reed Propeller

400 H.P. CURTISS SERVICE PURSUIT
Curtiss-Reed Propeller

CURTISS-REED PROPELLERS

ALL machines competing in the 1926 Schneider Cup Race at Norfolk, Virginia, on November 13th, were equipped with the R-type of Curtiss-Reed Metal Propeller.

This new forged type of one-piece propeller has been developed to meet the superlative demands of racing aircraft, and is now available for service use in both military and commercial aircraft.

Quantities have been supplied to both the U. S. Army and Navy for use on standard Service planes.

THE CURTISS AEROPLANE & MOTOR COMPANY, INC.

Offices:
GARDEN CITY, N. Y.

Curtiss

Factories:
GARDEN CITY & BUFFALO, N. Y.

L. D. GARDNER
PRESIDENT
EARL D. OSBORN
VICE PRESIDENT
L. D. WEBSTER
TREASURER
GEORGE NEWBOLD
BUSINESS MANAGER

AVIATION

W. LAURENCE LEPAGE
EDITOR
VIRGINIUS E. CLARK
RALPH H. UPSON
CONTRIBUTORS

VOL. XXI DECEMBER 6, 1926 No. 23

The Air Corps Personnel Problem

ANOTHER TWELVE months have passed and Major Gen. Mason M. Patrick, Chief of the Army Air Corps has just tendered his annual report for the fiscal year ending June 30, 1926. This past year has seen a number of improvements effected in the status and future outlook of the Air Corps but General Patrick's report indicates the situation to be by no means satisfactory under the existing status quite apart from any views which may be possessed individually outside the Service regarding an independent air force.

The most significant section in the report, undoubtedly, is that dealing with commissioned personnel. General Patrick complains that there is a serious shortage of good pilots among the officers of the Air Corps and illustrates the gravity of the situation with the statement that no less than twenty-one commissioned pilots resigned from the service during the year under review to take up positions either in commercial aviation or in other lines of industrial life. That commercial aviation, though in its infancy, should offer an enticement to service pilots, points very strongly to a serious condition existing in the Air Corps and it is with a view to remedying this condition that the Chief makes certain recommendations.

The all important question of promotions in the Air Corps has never been satisfactorily settled, yet recommendations for a separate Air Corps promotion list, which are made by General Patrick in his Annual Report this year, have already figured in previous Annual Reports of the Chief of the Air Corps but with little avail. Legislation passed by Congress during its last session requires the Secretary of War to make a study of the present promotion list and to submit to Congress recommendations for changes. The Air Corps is still awaiting such action and, in the meantime, is losing valuable personnel which cannot be replaced quickly.

Some indication of the seriousness of the entire situation is to be gained from General Patrick's remarks concerning training in the Air Corps. Good pilots, he asserts, are born rather than made, and this would appear to be the case when consideration is given to statistics relating to the Primary Flying School of the Air Corps. Of the total number of applicants for flight training each year, a very small percentage actually complete the flying course. During the year under review, there were 1288 applicants for flying instruction, but only 362 passed and, of this number, only 254 were appointed as flying officers. The cost of flying training is exceedingly high and, while conditions in the service itself are such as to discourage officers from remaining in the Air Corps, there is little likelihood of any economies being possible in training activities, which swallow up a large part of the Air Corps appropriations.

The whole problem of the status of commissioned personnel in the Air Corps is of even greater import inasmuch as it will have a marked influence upon the structure of the Air Corps in the future. Legislation passed by the 69th Congress stipulates that the higher commands of the Air Corps shall be filled by flying officers. As General Patrick points out, there is a distinct lack of personnel available for the higher commands since these must be held by fliers and the standards cannot be lowered, yet it is becoming more apparent that the present higher grades cannot successfully complete the flying course. And it would seem that, if the conditions of promotions remain as they are at present, this condition is not likely to be remedied.

The United States Army Air Corps has boasted of the finest pilots in the World but, if consideration for their welfare is continually neglected, our flying laurels will soon disappear altogether and, no matter how superior our equipment may be, we shall find ourselves supporting a second rate Air Corps.

The New Era of European Air Transportation

EUROPEAN DEVELOPMENT of civilian aeronautics is so curiously intermixed with political expediency that it is hard for Americans fully to make out what represents natural development on an economic basis and what is being developed merely for international prestige. Incidently, it might also be said that it is probable that many Europeans, too, are either confused or misled in respect to this question. America, without the stimulus of international competition and the subsidies which have been granted by European nations has lagged behind Europe in air transportation but there is one fundamental aspect of the economic side of air transport which America has fully appreciated from the beginning and which Europe has only just begun to develop on a scale which compares with its other air transportation activities. This fundamental aspect is the necessity for long routes if airplanes are to compete with other forms of transportation.

Almost from the beginning our own air mail authorities realized that a transcontinental service was the route which would be most useful and which in the end would be most likely to pay. In Europe, probably due to boundary difficulties, the value of the long runs has not really been appreciated until recently. The great majority of commercial flying has been carried on between the European capitals which meant comparatively short flights.

The year 1927 will see Europe entering into a new phase of air transport competition. Germany, cooperating with Russia, will extend its Moscow line towards China. England will start its service from Egypt towards India which is the first link of the service to Australia. France and Spain are both planning services to South America while Italy plans lines to Africa and also to the near East. Air lines which were fostered in Europe in the main for military purposes will now be developed to gain supremacy in the realm of commerce. The history of maritime competition is beginning to repeat itself in the history of air transportation.

Annual Report of The Chief of Air Corps

General Patrick again Recommends Separate Air Corps Budget and Emphasizes the Highly Specialized Work of a Flying Officer and Consequent Lack of Commissioned Pilots

THE ANNUAL Report of Major Gen. Mason M. Patrick, Chief of the U.S. Army Air Corps, for the fiscal year ending June 30, 1926, has been made to the Secretary of War. Extracts and the main recommendations and comments are printed below:

Disposal of Surplus Material

During the fiscal year, airplane engines and other miscellaneous aeronautical equipment representing a total cost to the Government of $8,564,155.19 were declared surplus and reported to this section for disposal. In addition to the above, there was on hand surplus property which had been released during the closing months of the preceding fiscal year, amounting to $1,423,931.06, making a total available for the year of $9,988,086.25.

The principal items making up this surplus were: 867 new Liberty "12" engines; 926 used Liberty "12" engines; 500 used Wright "A" engines; 296,800 lb. No-oxide, Grade "C", rust preventative compound; and one lot Special machinery, and miscellaneous equipment, including aerial cameras, lenses, etc.

Transfers of property, without funds, to branches of the Government other than the War Department were accomplished during the year amounting, at Government cost, to $855,753.12. Included in these transfers were 200 new Liberty engines turned over to the U. S. Coast Guard, which were desired by that service for use as marine engines in prohibition enforcement work.

Sales were consumated during the year of property which cost approximately $4,800,000 including 156 new and 426 used Liberty engines; 424 used Wright "A" engines; and practically all of the other items enumerated in the above list of surplus.

The net cash return to the Government from the above sales was $600,871.09, or 12½% of cost. This compares favorably with the return of only 21/3% of its value, on property sold in the preceding year.

The major items awaiting disposal at the end of the year are as follows: 511 new Liberty engines; 500 used Liberty engines; and 76 used Wright "A" engines.

It is recommended that the policy now in effect of selling new Liberty engines be continued until a decided reduction is effected in the considerable number on hand.

Purchase of New Aircraft

The table below contains a concise summary of all new airplanes purchased, for which funds were obligated during 1926:

100	Primary Training and spares	$938,530.71	
1	Nieuport	4,984.21	
65	Pursuit and spares	885,183.35	
10	Cargo and spares	255,176.00	
35	Observation and spares	459,229.00	
15	Amphibians and spares	339,974.10	
24	Bombardment	950,676.00	$3,833,753.37
35	Remodelled steel fuselages		167,537.25
			$4,001,290.62

Barracks and Quarters

It has come to the attention of this office that a number of married non-commissioned officers are neither receiving quarters, because of the lack of such quarters, nor allowances in lieu thereof, because of reduced appropriations. Such a situation is to be regretted and if continued, will result in the loss of valuable men. It is, therefore, again urged that the construction of barracks and of quarters, particularly for married non-commissioned officers, be expedited.

Personnel

Foreign Garrisons:—The foreign service garrisons are at approximately half their commissioned strength, which is considered more than ample in view of the material available for their use. The tactical and school units in the United States are not so well provided for. All are operating with from 20 to 50 per cent of their authorized commissioned personnel. These units cannot function properly until additional pilots and observers are provided.

Commissioned Strength:—The problem of increasing the flying commissioned strength of the Air Corps is a serious and difficult one. While it seems probable that applicants for commission would be many, the percentage which can really qualify as flying officers is unfortunately too small at present. At the same time a number of Air Corps officers are resigning. During the past year there were twenty-one resignations. This is partly due to the opportunities offered by commercial air transportation companies, and to the fact that, under present conditions and the positions of a number of junior officers on the promotion list, the prospects for advancement in the Army are most discouraging. So long as such conditions exist and no steps are taken to correct what is believed to be an injustice done these junior officers, it may be expected that more and more of them will separate themselves from the service.

There is, of course, the continued lack of a sufficient number of officers in the higher grades of Colonel and Lieutenant Colonel. For this, apparently time is the only remedy. The law specifically requires that Air Corps organizations shall be commanded by flying officers. The flying training standards cannot be lowered. Everything indicates that there are very few, if any, officers who have reached the grade of Lieutenant Colonel or Colonel who can successfully complete this flying course. Without becoming flying officers, such would not be able to exercise commands appropriate to their rank.

Promotion:—In last year's annual report, the establishment of a separate promotion list for Air Corps officers was recommended. This would undoubtedly remove many of the disabilities under which the Corps labors at present. Just after the close of this fiscal year legislation which became law requires the Secretary of War to make a study of the present promotion list, its alleged injustices, and to submit to Congress his recommendation as to changes, if any. No positive recommendation is, therefore, made in this report concerning these matters, awaiting this action on the part of the Secretary of War.

Flight Surgeons:—There were forty-seven flight surgeons of the Medical Corps on duty with the Air Corps on June 30, 1926. This number should be augmented by approximately ten more to provide an adequate number for present needs.

Warrant Officers:—The number of warrant officers allotted the Air Corps has been further reduced during the fiscal year from forty to thirty-four. More warrant officers are needed, particularly for the supply duties devolving upon the Air Corps. This would relieve to some extent the existing shortage of officers.

Enlisted Strength:—The Air Corps has been well over its authorized enlisted strength throughout most of the year.

Enlisted Pilots:—The number of enlisted pilots is increasing, due primarily to the authority granted by the War Department to retain in the service flying cadets who have completed training and who are assigned to duty with tactical units.

Flying Cadets:—During the year, 1288 applicants were authorized to be examined with a view to appointment as flying cadets. As a result of the examinations, only 362 candidates were found qualified. Of this number 254 were appointed. 233 of them were sent to the airplane training school and 20 to lighter-than-air training.

Small Per Cent Learn to Fly:—Of the total number of students that enter the Primary Flying School, and of all classes, the officers of the Regular Army, of the Reserve, of the National Guard and the flying cadets, the number completing the entire course at this school and at the Advanced School is very small.

It becomes more and more apparent that some men can learn to fly and that others cannot, just as some have musical or mathematical ability and others have not. Every effort is being made to devise or to discover tests which will indicate as soon as possible and as accurately as possible whether or not a man does possess this innate ability to learn to fly. The attempt to teach one who lacks it is a waste of time, money and effort. The Flight Surgeons School, recently moved to Brooks Field, San Antonio, Texas, is studying this problem intensively. It is hoped that all of these efforts will result in the establishment of facts which will make it possible to determine with a fair measure of accuracy whether or not it is worth while to attempt the training of a candidate, preferably before he is entered in the class or at least very promptly thereafter.

Experimental Engineering and Research

Finance:—The appropriation for experimental and research engineering for the fiscal year 1926 was $2,730,000.00. This was a decrease of $350,000.00 over the previous year. Of this amount, $2,644,900.00 was allotted to the Engineering Division by the Chief of Air Corps, with a limitation of $1,730,000.00 for pay of civilian personnel.

Trend of Airplane Development:—There have been no outstanding changes in the trend of airplane development during the year. Most of the production airplanes now being purchased are of the single bay externally-braced biplane type, with semi-thick wings. There is very little indication of any marked change from this type of structural arrangement, except for large heavy bombers, the design for two types of which are being prepared for the consideration of the Air Corps. Three three-engined monoplane transports are being purchased. These items cover the only deviations from an almost universal use of the biplane type of construction. In the bomber type there has been a reaction from the single-engine type to the twin-engine type as engines and propellers have become available, which will enable the airplane to fly with only one engine operating, which promises an improvement in the arrangement of personnel.

The airplanes received at the Division during the year have shown a more extensive use of metal for structural parts. Most fuselages are of welded steel tubing, although duralumin has been used in some cases. There has been a decided tendency to use chrome molybdenum steel tubing exclusively instead of low carbon tubing. The extensive use of duralumin, while desirable from the weight standpoint, has been delayed due to the increased cost and difficulties in fabrication and to uncertainty regarding its resistance to deterioration in service, especially in salt air near the seashore. Wood is still used almost entirely for wing structure, but much experimental work has been done in metal spar fabrication. The Thomas-Morse Corporation is building under contract five Observation airplanes called the O-6, entirely of metal.

The use of metal propellers is becoming more general due to increased efficiency.

Parachute Development:—The Army Air Corps has been the agency which has developed and demonstrated the reliability of the parachute. Twenty-eight lives have been saved in emergencies as the direct result of this parachute development. The publicity given this fact has undoubtedly materially increased the feeling of safety on the part of the civilian populace in the use of aircraft.

Supply

Damage by Fires:—Storage facilities and shops suffered during the past year by nineteen fires. Five of these were very serious and involved considerable property. The total loss resulting from these fires was estimated at $1,521,814. While every precaution is taken to protect Air Corps property, it must be remembered that this property is for the most part very inflamable and that Air Corps stations where it is stored are generally of temporary war-time construction, making the fire hazard very great.

Supplies for the National Guard:—During the fiscal year 1926, 49 complete airplanes and 62 airplane engines were issued to the National Guard. The total value of supplies issued during the fiscal year was $78,881.97. The cost of reconditioning supplies and equipment issued, amounted to $148,453.

Supplies for the Organized Reserves:—Under policies as outlined in the National Defense Act and as promulgated by the War Department, the Air Corps has done considerable work and spent much money to facilitate the flying training of Air Corps Reserve officers. A number of airdromes were installed near important cities, at which the Army Air Corps has built hangars and maintains sufficient aircraft and personnel in order that Reserve officer may be given the opportunity to fly while on inactive duty. This has been in addition to the aircraft maintained at regular service airdromes for the use of Reserve officers, and the service type aircraft flown by Reserve officers while on periods of active duty with tactical units.

Supplies for Other Agencies:—Supplies and equipment as shown by the following table were transferred to the Reserve Officers' Training Corps, Citizens' Military Training Camps, Department of Agriculture, Navy Department, Air Mail and other agencies:

	Free	Charge	Total
Reserve Officers' Training Corps	$1,776.26	$1,072.94	$2,849.20
Citizens' Military Training Corps		495.40	495.40
Dept. of Agriculture		9,122.44	9,122.44
Navy	4,680.00	112,544.20	117,224.20
Air Mail	1,170.00	5,481.85	6,651.85
All other agencies	1,684.10	100.00	1,784.10

Training

Flying Time:—The following is the table of flying time at Air Corps Special Service Schools during the fiscal year of 1925-26:

	Man Hours	Aircraf Hours
Primary Flying School	44,854	27,241
Advanced Flying School	43,766	26,193
Balloon and Airship School	5,863	2,139
Tactical School	2,703	1,440

Organized Reserves:—This whole matter of the training of the Organized Reserves is one of extreme importance and one which deserves most careful study. During the year just passed there was submitted to the War Department a radical recommendation which, if adopted, would place the whole scheme of Reserve training on the basis of the flying efficiency of the individuals trained. In the case of many of these Reservists who were war-timed trained, their efficiency has diminished with the passing years

The actual cost of flying training for the Organized Reserves has been determined as accurately as possible. This average cost per hour of flying time for a Reserve officer is about $23.50, which sum covers the purchase of gasoline, oil, spare parts and the maintenance of the equipment in use. Upon the assumption that Reserve officers, while on fifteen days' active duty, fly an average of 1 4-5 hours per day, the cost of thus training one thousand such officers is, on this basis, about $42,000.

National Guard:—There are now sixteen federally-recognized Observation Squadrons in the National Guard. Fifteen of these are Division Squadrons and there is one Army Observation Squadron.

At the close of the past fiscal year, the strength of the National Guard Air Corps was 271 officers and 1,376 enlisted men. The 271 officers include 184 rated pilots, 33 rated observers and 54 non-rated officers.

The average flying time of all squadrons per month for the fiscal year was 87 hr., 5 min. aircraft flying time, and 154 hr., 11 min. man hours of flight.

Reserve Officers' Training Corps:—Six Air Corps Reserve Officers' Training Corps units have been maintained at civil institutions during the year. The enrollment at the close of the school year 1925-26 was 1005.

The Air Corps has only two sources for procuring Reserve officers, viz., Reserve Officers' Training Corps units and graduates of the course for flying cadets. At the present time, the training of flying cadets is limited to 212 annually, whereas, after reaching the peacetime objective of Reserve officers needed for the Air Corps, it is estimated that an annual replacement of approximately 2,000 will be required. At least 500 of this number should come from the Reserve Officers' Training Corps. In order to obtain 500 Reserve Officers' Training Corps graduates annually, it will be necessary to establish additional units. It is believed, therefore, that the total number of Reserve Officers' Training Corps units at civil educational institutions should be increased to 12 at the earliest practicable time and that every effort should be made to expand the units now in existence.

Special Projects

Forest Patrol:—The Air Corps provided for daily patrols over large forest areas in the West during the Summer months for several years, both personnel and equipment. In 1925, due to the shortage of flying personnel, ter planes were furnished and the Department of Agriculture employed Air Corps Reserve officers to do the flying. This scheme worked out so satisfactorily that the Department of Agriculture requested its continuance. However, the War Department has advised the Department of Agriculture that the extreme shortage of equipment will probably prevent such further co-operation.

Dusting Experiments:—The experimental dusting of cotton from airplanes for the destruction of the boll weevil has been conducted for several years in co-operation with the Department of Agriculture. Near the close of this year, however, the equipment was transferred to the Department of Agriculture and the Air Corps personnel relieved. It is believed that these dusting experiments will eventually provide a new and extensive avenue for the employment of commercial aircraft. Dusting experiments have been extended from the cotton crop to include locust destruction in the Philippines, and treatment of apple orchards and alfalfa fields.

Motion Pictures:—Pursuing the policy for the extensive use of motion pictures to record special projects and training features at Air Corps stations, eleven of the regular flying fields have been equipped with aerial motion picture apparatus.

Airways:—In an effort to further safeguard the airways, six additional meteorological stations have been installed or are in process of being erected.

Civil Aviation

In Europe:—In the annual report of the Chief of Air Corps for the last year, a survey of the aeronautical situation in Europe was submitted. This was possible because an Air Corps officer had just then journeyed over many of the civil air lines abroad. During the past year additional data has been secured and certain conclusions may be drawn from a study of these facts and figures.

It may safely be said that in the transportation of mail by air the United States is well in the van. In carrying freight and passengers, more progress has been made abroad. This growth in Europe is largely due to government aid in the form of subsidies. Such subsidies have, of course, not been available to struggling civil flying concerns in the United States.

Conclusions and Recommendations

Finance:—In previous reports, a separate budget for the Air Corps was recommended. It is still believed that it would be well to segregate and to place in such a separate budget all sums for the maintenance of the Air Corps.

Stations:—Attention is again invited to the fact that at most of the Air Corps stations, there are few, if any, permanent structures and that the personnel is still sheltered in temporary buildings erected during the war, which are wholly inadequate for the purpose they are serving. It is recommended that the Air Corps construction needs be placed as high as possible on the priority list.

Military Personnel:—In the last annual report, a separate promotion list for Air Corps officers was recommended. This matter is treated elsewhere in this report. The unfortunate position of many of the Air Corps officers on the single promotions list has been pointed out repeatedly.

Civilian Personnel:—In the interest of economy, considerable reductions have been made in the rolls of civilian personnel employed by the Air Corps. It is impossible to see how any further considerable reduction can be made without seriously impairing the efficiency of the Air Corps.

Training:—The Air Force Maneuvers which were held during the past two years have proved of the greatest value. It is strongly recommended that these manuevers be made an annual event and that they be fixed during the Spring of the year when the Winter training is finished and before the Summer training camps begin. During this year there was present at the manuvers a representative of the General Staff. At least one such representative should always be present.

The machine gun and bombing matches were conducted again this year at Langley Field and the interest taken in them, the results obtained, the experience gained, were all greater than ever before.

In addition, demonstrations were given this year at Fort Leavenworth and Fort Riley. These enabled the students at the General Service School and at the Cavalry School to obtain first-hand knowledge of some of the things which the Air Force can accomplish. It is recommended that these demonstrations be given each year at these various special service schools at such times as will be appropriate, both for the Air Corps and for the schools in question.

In view of the absolute necessity for increasing the output of the Air Corps flying schools and of the urgent need for sufficient personnel to carry on this major activity of the Air Corps, it is recommended that Air Corps personnel assigned to other than strictly Air Corps duty be kept at the minimum.

National Guard and Organized Reserve:—The Air Corps has supplied for National Guard and Organized Reserve training such equipment as it had available. Practiically all of it was war-built. It has been retained and kept fit to fly but it is being rapidly worn out and must soon be replaced. Unless provision is made for the purchase of new equipment for this purpose, it will be necessary to postpone or curtail all Organized Reserve and National Guard flying.

Reserve Officers' Training Corps:—The Reserve Officers Training Corps provides the best source for procuring Reserve officers for the Air Corps. For this reason, it is again recommended that the number of these units be increased and that the present units be increased in size just as soon as the Regular Air Corps personnel will permit providing a sufficient number of competent instructors.

Civil Aviation:—The law placing civil aviation under the Department of Commerce has been mentioned elsewhere in this report. The Air Corps has endeavored in every way possible to co-operate with the Department of Commerce in carrying out this Act. It is recommended that such co-operation be continued and that the two departments work closely together as the steady and rapid developments of commercial aviation is intimately related to the solution of the air defense problem of the United States.

When the legislation pending at the close of the fiscal year is enacted, differences of opinion which have been so pronounced in the past should no longer be in evidence and all who are interested in the proper development of aviation, both commercial and military, should work together wholeheartedly and loyally to put this legislation into effect.

Pilots Start for Australia

Neville Stack and Bernard Leets, two British civilian pilots, started from Hendon in two DeH Moth lightplanes, on Nov. 14, for a destination described as unknown, but which they admit is Australia.

Each pilot will be his own mechanic, helping the other in case of need. The kit they carried weighed 10 lb. The venture is being undertaken to prove the practicability of long flights in small machines.

Prague-Berlin Air Line to Start

A Prague-Berlin air line may be started as the result of negotiations between Czechoslovakia and Germany regarding an air treaty, according to a report to the Department of Commerce.

Commerce Department Reports on Aviation

Assistant Secretary MacCracken Prepares First Aeronautics Section of Annual Report of the Department of Commerce

RECENTLY, THE Annual Report to the President, for the fiscal year ending June 30, 1926, of the Hon. Herbert Hoover, Secretary of Commerce, was published. The purposes of the Air Commerce Act of 1926, which created the assistant secretaryship and an aeronautics branch in the Department of Commerce, and plans for developing air mail, freight and passenger carrying traffic are set forth in the section of the report prepared by Assistant Secretary of Commerce for Aeronautics William P. MacCracken, Jr. The full text of this section follows:

The Air Commerce Act of 1926 (approved May 20) established a Federal policy with reference to commercial aeronautics and placed its administration under the Department of Commerce.

In general terms the act provides that the same essential services shall be given to navigation of the air which provided for over a hundred years in navigation of the water. The department is charged with the duty of registrating eligible aircraft, certifying to their air worthiness, examining the operating personnel and air navigation facilities, also of establishing air traffic rules. It is authorized to lay out airways, provide for lighting, mapping, and emergency landing fields and in other directions furnishing assistance to aviators such as radio-direction fog-protection facilities, weather information, and other aids to navigation. The department is further charged with the general development and promotion of commercial aviation.

The purpose of the Government has been threefold-first, to secure better development of this new form of transportation for commercial purposes; second, to create private commercial services which can relieve the post office of its direct expenditure upon air mail; and third, by the creation of a large commercial air fleet with its accompanying personnel and its background of the manufacturing industry to give a fundamental military reserve to the country.

On Jan. 1, 1926, there were 369 miles of air transport services in operation by private enterprises, and there were 2,665 miles operated by the Post Office Department. Assurance of congressional action and the official passage of the act have resulted in considerable preparatory activities by private enterprise. Little commercial aviation could be organized until the fundamental services above mentioned were assured, as no commercial concern could undertake to provide these aids to navigation at its individual expense, not only because of the large preliminary outlay but because such facilities would be equally available to competitors.

The work of the department in development of the new aviation division has during the past fiscal year been of preparatory order like that in the industry. It may be said, however, that already commercial operations have been undertaken in reliance on the provision of the air commerce act in a number of directions, and it seems certain that the Post Office Department will be able to let contracts which will relieve it of all transportation of the air mail during the present fiscal year. It will thus convert a very large postal loss into a certain postal profit.

Already between 6,000 and 7,000 miles of airways are under actual operation. We hope this may be extended by another 5,000 miles during the present fiscal year, and that most of the important centers of the country will be intereconnected by this new form of transportation carrying mail, express, and passengers.

Anti-Aircraft Service Training

In his Annual Report to the Secretary of War, for the fiscal year ending June 30, 1926, Major Gen. Andrew Hero, Jr., Chief of Coast Artillery, discussed the training problems which have been presented to the Coast Artillery Corps under three headings, one of which dealt with those questions incident to the development of efficient methods and suitable material to assure accuracy of fire in the several parts of the Anti-aircraft Service. The following paragraph is extracted from General Hero's report as dealing with the anti-aircraft training activities during the period under review:

The anti-aircraft tests held by the 62nd Coast Artillery Corps (AA) at Fort Tilden, New York, during the months of May to September 1925, were of the greatest value in contributing to our knowledge of the efficiency of anti-aircraft gun and machine gun fire against air targets and of the ability of searchlights directed on data furnished by sound locators to pick up planes at night and to hold them in the beam. The three inch guns ammunition and range-finding apparatus in use, with the exception of the stereoscopic height finder used from July 15 to the end of the tests, were of war-time design and manufacture. Following the Fort Tilden exercises, studies were made in this office, at the Coast Artillery School, and by the Coast Artillery Board, which have been reflected in marked advance in accuracy of fire and the precision with which searchlights locate planes at night. The following table shows the comparison in gun fire; the figures include all practices for which reports have been received:

	Fort Tilden 1925	*All batteries, first half of 1926*
Total shots fired at moving targets	4343	727
Hits	203	68
Percentage of hits	4.67	9.35
Hits/Battery/Minute	2.03	3.50
Shots/Battery/Minute	43.4	37.4
Slant range (yards)	3962	3844
Horizontal range (yards)	3524	3377
Altitude (yards)	1890	1837
Ground speed of plane	60.7	67.4

Air Survey in Saskatchewan

The authorities of the Province of Saskatchewan are reported to be making arrangements for the preparation of a comprehensive geological air survey of the northern part of that province, according to advices to the Department of Commerce.

The project, it is said, will be undertaken for the purpose of determining the mineral wealth of the district to be surveyed and, when the maps are completed, the mineralized areas will be indicated as an aid to prospectors interested in that region.

It is said in Canada that two seaplanes will be employed in the survey and that the work probably will commence in the spring of 1927.

Danish Air Service Increases

On Oct. 15, the Danish Air Service closed its Summer season and in this connection made public certain statistical material pertaining to the operations during the past Summer.

According to the Director, the planes of the Danish Commercial Air Service during the past season flew 203,550 km. against 20,417 last year and carried a total of 1,033 passengers as compared with 1,128 last year. Baggage and freight carried during 1926 aggregated 26,803 kg. as against 17,126 kg. during the preceeding season and, in addition to this, 1,079 kg. of mail were carried. The safety percentage has been one hundred and the service on the Hamburg route has been carried with 98.6 per cent safety and on the Cologne route 95 per cent.

The Secretary of War Reports on Aviation

Secretary Davis Discusses Legislation and Air Corps Activities as They Pertain to Commercial Aviation

THE ANNUAL Report to the President, for the fiscal year ending June 30, 1926, of the Hon. Dwight Davis, Secretary of War, has recently been made. On the question of aviation Secretary Davis discusses at some length and lays considerable emphasis upon the activities of the Air Corps as they pertain to the development of commercial aviation. Extracts from Secretary Davis' report follow:

Air Corps

Commercial aviation is in the pioneer stage. As has been the case in other fields of pioneer endeavor, civil industry relies upon the military and naval establishments for a large part of the research, improvement, and development necessary to place this new industry on a firm foundation. I will confine my discussion to a few of those recent developments which have promoted development of our air commerce.

Wing sections, engine mounts, and landing gears, developed by the Engineering Division of the Army Air Corps, are now being used by several commercial aircraft companies. Considerable success has accompanied the experiments on airplane cockpits and cabins for the purpose of making them more comfortable, better ventilated, and warmer. All engines now under development by the Army Air Corps can be used for non-military and military purposes. The Cam and the Almen engines are of outstanding non-military value as they show promise of low cost production. All engines now being built for non-military planes are equipped with carburetors developed for military agencies. The improved cooling systems, electrical instruments, fuel systems, and installations recently developed by the Air Corps, are as applicable to use by civil aeronautics as by military aviation.

While the supercharger development recently made by the Army Air Corps has no immediate value for non-military aviation, it has been found of considerable benefit to other industries, chiefly automobile, rail car, and gas-electric locomotive. The superchargers used by practically all racing automobiles are a direct outgrowth of military supercharger development.

The Air Corps has been engaged continually in the study of new commercial fuels, of sources and methods of preparation of fuels and lubricants, of new types of lubricants, of light oils for cold weather operation, and of special blended oils for improvement of engine-part lubrication. Obviously, such developments in fuels and lubricants are of great value to commercial aviation.

The Army Air Corps is actively engaged in the development of aerial photography and in carrying out projects which are of direct and indirect benefit to commercial enterprise. During the fiscal year 1926 the Air Corps made aerial photographs of 40,000 square miles of areas in various parts of the United States for the Geological Survey as part of the program for the topographic mapping of the entire country. It has engaged in aerial photography in connection with the development of our rivers and harbors, and in aerial surveys of the Tennessee River and the Mississippi River for the purpose of flood control, power-dam sites, irrigation, and transportation. The Air Corps has continued for other Federal bureaus its aerial surveys on the Canadian and Mexican borders and the mosaic mapping of all important harbors and shipping facilities on the Atlantic, Pacific, and Gulf coasts. It has accomplished considerable photography for crop estimation, reclamation, forestry, highway construction, and national parks.

This corps is jointly engaged with other governmental agencies in determining the possibility of fog dispersal by the flight of aircraft over fog areas. If successful, this will prove of especial value for clearing fog over harbors and over landing areas where there may be congestion of aircraft. The Air Corps has charted the principal and only air routes over the country and has listed many thousands of municipal landing fields on a specially prepared airways map, which is in much use by commercial aviation. In conjunction with the Engineer Corps, it has developed a special type of air navigation map which is particularly valuable for air navigation and is in much demand by commercial fliers.

The Air Corps has cooperated extensively with the Department of Agriculture in the extermination of the boll weevil and other insect pests by spraying poison from airplanes; with the Bureau of Forestry in the experimental planting of tree seeds in mountain regions; and with the Philippine Government in the extermination of locusts by dusting poison from airplanes.

Legislation

On the general question of air legislation, Secretary Davis draws attention to the fact that his department is opposed to the idea of an independent air force and observes that the several air investigations which have been carried on in Washington in the not distant past have not made any definite recommendations contrary to this view. Discussing the findings of the Presidents Aircraft Board and the two congressional committees, the Secretary of War continues:

The final result of these investigations was the enactment by Congress of an important and constructive measure which will serve to further increase the morale and technical efficiency of our Army Air Corps. This law gives effect to the following provisions:

Changes the name of the Air Service to the Air Corps.

Provides an increase of two assistants to the Chief of the Air Corps with the rank of brigadier general.

Prescribes requirements for the rating of pilots of service types of aircraft.

Authorizes the rating as air mechanics of not to exceed 14 per cent of the total authorized enlisted strength of the Air Corps.

Authorizes temporary rank for Air Corps officers assigned to flying commands.

Directs the study of alleged injustices in the promotion list of the Army and the submission of a report on this matter to Congress by the second Monday in December, 1926.

Creates for a period of three years an air section in each of the divisions of the War Department General Staff.

Provides a five-year Air Corps program for an authorized increase of 403 officers and 6,240 enlisted men, and also for calling to active service for periods between six months and two years of not to exceed 550 Air Corps reserve officers.

Authorizes the Secretary of War to equip and maintain the Air Corps with not to exceed 1,800 serviceable airplanes, this number to include those planes necessary for the training and equipment of the National Guard and the training of the Organized Reserves.

Prescribes that the annual replacement of airplanes shall not exceed 400.

Provides for an additional Assistant Secretary of War.

Provides for design competition and prescribes certain requirements relative to the purchase of aircraft, aircraft parts, and aeronautical accessories.

Authorizes the award of a "soldier's medal" for heroism not involving actual conflict with the enemy and of a "distinguished flying cross" for heroism or extraordinary achievement while participating in an aerial flight.

The War Department immediately placed in effect the important provisions of the law which were amendable to administrative action, without further legislation.

The same session of Congress also enacted the "Act to encourage and regulate the use of aircraft in commerce, and for other purposes," known as the Air Commerce Act of 1926. However, the bill contemplated that effect to its major provisions should await appropriations by the next session of Congress, to which this department will be prepared to submit complete reports and estimates.

Its provisions are designed to foster and regulate commercial aviation. The administration has been placed in the hands of the Secretary of Commerce. While it is not a military measure, the approval of the air commerce act of 1926 is of great import to the War Department, for whatever may benefit civil aviation will also benefit military aviation. The Air Corps, like all the other branches of the Army, must depend on civil sources for the resources with which to meet major emergencies.

Italian Schneider Team Accepts Congratulations

In reply to its recent letter of congratulation to the Italian Schneider Cup team on their victory in this contest at Norfolk, Va., recently, The Curtiss Aeroplane and Motor Company received, under date of Nov. 21, the following letter from Muzio Macchi, with the Italian Team in this country:

Gentlemen:

I received with the greatest pleasure by your letter of Nov. 15 your congratulations, which I have just transmitted to Mr. Ferretti, Engineer of the Fiat firm, to Major Mario de Bernardi, and to all the members of the Italian team.

While waiting to thank you on my approaching visit to you, I am giving you below the telegram with which my father congratulated our team immediately after the victory:

"Macchi c/o Italian Racing Team, Norfolk, Va.

"While saluting our chivalrous opponents, we embrace de Bernardi, Engineers Castoldi and Ferretti and everybody

"Ing. Giulio Macchi

"President"

After our victory I can however say with satisfaction that our two firms, alone, knew how to build this year equipment capable of beating the preceding records, the performances of Cuddihy, piloting the No. 4, having superbly demonstrated this.

Also I wish to thank you for your collaboration in furnishing us, first, the wonderful metal propellers, and finally, for the adjusting of these propellers in the last few days preceding the Race.

Again with open heart and right arm lifted, we salute our chivalrous opponents.

For Aeronautica Macchi
(Signed) Muzio Macchi

A Correction

The article on the Waterbury Lightplane Club, which ran in the November 22 issue of AVIATION, in error was called the Westbury Lightplane Club, and the picture of the Jenny used in the article was also credited to the Westbury Lightplane Club.

The lightplane club, which was organized in August, at Waterbury, Conn., bears the name of the city where it was founded.

The Fliers' Aspects of Aerography

*Dispelling the Clouds**

By PROF. ALEXANDER McADIE
Director, Blue Hill Observatory, Harvard University

THERE ARE many experiments in a laboratory which fail when performed in the open air. Sometimes they fail even in a carefully prepared lecture; and, as the old professor of chemistry at Harvard used to say when what he said would happen did not happen, "The experiment has failed gentlemen, but the principle remains! And we now proceed with the next experiment."

Again it does not follow as many inventors and investors have learned to their cost, that because a model works nicely, the large machine built to scale will also operate. Very often it does not. This was found to be the case in testing models of airplanes in wind tunnels and comparing the results with the performance in free air.

Experiment and Practice

We must not, then, too confidently anticipate that experiments in dissipating fog or dispelling cloud as made in the laboratory where the fog is confined, will, when repeated on a large scale in the open, be followed by immediate results. The causes producing fog may be continuously operating; and no matter how energetically we scatter fog particles, the steady streaming in of similar particles offsets the work done. In other words, if a fog or cloud is building more rapidly (or even with equal rapidity) then we can tear it apart, there will be no apparent result. In such cases the experiment would seem to fail. To a by-stander there would be no evidence of work done; and naturally he would describe the attempt as a failure. To fight an on-rushing river of fog, or an unending stream of cloud will require a battalion of planes with precipitating apparatus working at maximum capacity. Probably it can be done; and the equipment required can be provided; but the expense at the present time, would be out of all proportion to the value of the results accomplished. So then let us begin with a clear understanding that the purpose of present experimentation is primarily to dispel a limited amount of fog over a restricted area. For example, a morning radiation fog over a landing place. Both in taking off and in landing, the presence of fog is a menace. Again, while in the air, diminished visibility means a considerable element of danger. We believe that the air is the coming medium of transportation; therefore, judging from bitter experience in connection with the operation of steamships and railroads, fog is the element to be dreaded above all others. From this point of view, fog is an unmitigated nuisance, and any method that looks toward the clarification of cloudy atmospheres, is to be welcomed.

Efficiency is a word much used by engineers. Actually, it means the ratio of the power input of a machine to its power output available for the purpose in hand. We spoke above of the difficulty of judging from models. Certain numbers must be used if large airplanes are to be built based on the performance of models in wind tunnels. Some such numbers are needed in characterizing the performance of cloud-dispellers under certain conditions. The name "Merit Numbers" has been used in another connection, but it might well be used here, for if a certain kind of fog is dissipated rapidly with comparatively little expenditure of electrified sand, we should be able to classify that performance as contrasted with more difficult and less economical attempts. In other words, we should be able to get graded measures of success depending upon conditions met in free air. These, of course, will be different from so-called efficiency ratings.

The time element is of great significance. How shall we compare two planes, one of which makes a rapid flight through a cloud, using much sand and high electrification for a minute or so, with a second plane using less sand and lower voltages but continuing to fly around and around in the fog until all the sand is used? One is reminded of the behavior of snow plows. Formerly it was customary to wait until the snow had stopped falling, then to send out plows to break a passage. Six or eight horses are needed when the snow is deep. On the other hand, last year motor plows were started almost with the beginning of the snow; and continued on the job until the snow ended. The period was unusually long—36 hours. The method was more successful than the old way. The first cost was large, but it was worth the expenditure. Under the old system, the fire risk during the storm was greatly increased because the fire engines were unable to reach premises without delay. Similarly, there may be times when need of fog dissipators is urgent. Let us suppose that a fleet must leave port at a certain hour. Half a dozen or more of the musquito fleet equipped with efficient fog dissipating devices, might well be kept busy maintaining fog-free lanes.

Fog Dissapation and Safety

But primarily the problem of fog dissipation is concerned with safety. There is hardly any line of investigation that promises so great a return as that of improving visibility.

Scattering fog and clarifying dusty atmospheres is not new. In the Transactions of the Royal Society, in the pages of "Nature" and "Science," for many years back, there are articles on the subject and references to various experiments. Rayleigh (the elder), Bidwell, Lodge and others have written on the subject. Cottrell's practical application of deposition and precipitation from the fumes of smelting works, is well known. Dr. L. Francis Warren's experiments of the past five years deal very directly with the dissipation of fog, and, in less degree, with rain-making. In fact, these experiments lift the problem of rain-making from charlatanism to sober, scientific and rather promising investigation. We can make clouds and mists in limited amount quite easily and without the expenditure of any great quantity of energy.

Why then can we not reverse the process? We cause cloudy condensation by cooling. The loss of heat may be due to expansion, radiation, transvection. That is, when we lift a mixture of air and vapor, we subject it to lessened pressure. There is expansion and increase of volume. Work is done against pressure. Our Summer showers illustrate the process of cloud building and rain-making. Again, every object is constantly gaining and losing heat by what is called radiation. The ground fogs of morning are primarily radiation effects. Finally, a body may be chilled by contact with a colder surface or the heat may be conducted away by molecular action. We do not recall any method of making clouds

*For those not familiar with scientific units and symbols the following conversion values will be convenient. A meter is 39.37 in., or 3.28 ft. A foot is practically 3/10 of a meter. A millimeter (mm) is the thousandth part of a meter. Roughly, it is 1/26 in. A line of type in AVIATION is about 90 mm. long and 2 mm. high. A micron (u) is 1/1000 of a millimeter. We use it in measuring dust and very small particles.

In spectroscopic work, still smaller units are used, the mu (millimicron) which is a millionth of a millimeter. The Angstrom is a ten-millionth of a millimeter. Physicists write it cm^{-8}, meaning .000,000,01 centimeter. A gram (g) is about 15 grains (gr.); a kilogram, 1000 grams, is 2.2 lb. Remember also that 1 meter per second is about 2.2 m.p.h. A kilometer is .62 mile. A mile is 1.6 kilometers. One mile an hour is 0.4 meters per second; 1.5 ft. per sec. is 1.6 km. per hr. One foot-pound is 1385 gram centimeters. One horsepower is 550 ft. lb. per sec.; or 746 watts. A kilowatt is about 1½ hp. Atmospheric pressure is now recorded in units of force. The megadyne (one million dynes) or megabar atmosphere is the barometer reading 29.531 in. or 750.1 millimeters, at freezing, and in latitude 45 deg. The force of quality or weight of one gram is 980.66 dynes. To convert kilobars (kbs.) or (mbs) into inches, multiply by 0.03. To convert kilobars (kbs) or (mbs) into millimeters, multiply by 0.75. To convert inches into kilobars (kbs) or (mbs), multiply by 33.86.

electrically. Passing a current through a wire and heating it red hot, will in confined damp air, give the necessary nucleae, and so a brief cloud may form.

But, speaking generally, there are no electrical means of cloud building. But it is quite easy to do the opposite, that is, scatter smoke, fracture fog or dispell cloud. It is only necessary to pass a spark or two through the mass and there is quick and rather dramatic dissipation. There is a well known lecture experiment. It is possible to break up a smudge or agglomeration of soot particles by bringing an electrically charged surface into the field. There is, at first, attraction of the whole mass and then what may be called, for want of a better name, an electrical explosion, the constituent particles apparently repelling each other. This virtually is pushing the fog mass away! No doubt a battery of blowers might prove of value and keep the fog moving; and if streams of warm air could be directed into the fog there would be evaporation and consequent improvement in visibility. But a battery of blowers cannot very well be taken aloft. For the purpose of dispelling fog or cloud that lies overhead, the electric process of Warren, that is, the use of electrified sand, is probably the most serviceable.

Thunder Showers

Everyone has noticed that, following a vivid lightning flash and quick thunder indicating nearness, the rain drops seem to grow larger and come down with a rush. We call these sudden intensifications, rain gushes. For example, if the flash is followed by a heavy clap of thunder five seconds later, and the rain gush begins ten seconds after the flash, it is plain that if the drops started from the same height above the ground, they could not make the distance, for the drops would need 170 sec. to travel the distance, their natural drop being about 10 meters per sec. Similarly, it would be an equal interval after the thunder began before the drops reached earth. That is, it would be nearly six minutes after the flash before the rain gush was noti ed. The interval generally is a few seconds. So there is something to explain. Possibly the drops in the lower strata are in a strong electric field and at the moment of equalization of potential, which is the moment of flash, these lower drops coalesce. The drops, then, would have been only 100 meters away.

The thunder or sound wave has no known effect. Just what does take place in a rain drop we do not know. When a drop is broken into smaller drops as by an uprushing current, electrification results. But that is only part of the story. We can tear small drops from a fine jet of water, by presenting a charged body. A cloud, even a small one, can be further electrified by the friction of an air stream rushing past it, and in this way a tremendously high voltage can be built up in a very short time. But aside from surface electrification and development by what we may call a mechanical process, there may be energy that has its origin in an atomic change. When mass is destroyed, a quantity of energy equal to mass multiplied by the square of the velocity of light is produced.

Aston has shown that, for one gram atom of hydrogen (the quantity in 9 cu. cm. of water) the energy is $0.0077 \times 9 \times 10^{20} = 693 \times 10^{18}$ ergs. In terms of work this is equivalent to 200,000 kilowatt hours. "In a tumbler of water," he says, "lies enough power to drive the Mauretania across the Atlantic and back at full speed."

It is not likely that the energy of a flash of lightning is developed in this way by the degredation of matter. We remain, however, in the dark as to what takes place when a rain drop is minutely subdivided; and these very small drops subjected to intense electrification.

Smoke

It is interesting to recall that an average smoke particle has a diameter of 1 micron (a millionth of a meter). In the atmosphere of a big city there are innumerable smoke particles. Shaw and Owens (Smoke Problem in Great Cities p. 170) state that "a man would breathe in the course of 24 hr. of such fog 500,000,000,000 particles of suspended matter. If placed end to end they would form a string 400 km. (250 miles) in length." But it would be a very delicate string, finer than a spider's thread. In a million meters of air, at ordinary temperature and humidity, there will be about 7,000 kg. of water. If saturated, there will be about two thousand additional kilograms. To condense that amount of water would require $9{,}000 \times 2.5 \times 10^{11}$ ergs or 21,900 kilowatt hours; about 30,000 horse power hours which is quite a large expenditure of power. But it is not necessary to expend all of the energy at once. To say that one must burn a million gallons of crude oil, or six thousand tons of coal to produce half an inch of rain is simply a scare statement for it overlooks the fact that a small expenditure of energy will often initiate consequences and motion entirely disproportionate to the energy expended. A very crude illustration is that of an elevator so counterbalanced that a small additional weight causes its ascent or descent. In other words, conditions of stability must be considered. When adequate apparatus is devised, as it probably will be, we shall all marvel at the ease with which demonstrable results in fog dissipation are obtained.

Spain Plans Seville-Buenos Aires Air Line

By a recent agreement between the Council of State and the Compania Transaera, the Spanish Government will establish an airplane line between Seville and Buenos Aires within the next three years. The terms of the agreement provide that the company must build and equip an airport at Seville at its own expense. The schedule calls for one monthly return voyage at first, which will later be increased to a fortnightly service. It is planned to extend this eventually into a weekly service, which will embrace the Canary Islands.

The planes in use between Spain and South America will be capable of carrying forty passengers and ten tons of freight. Those in the Canary Island service will have a capacity of sixteen passengers and one ton of freight.

The government will pay 500,000 pesetas to the company in the form of a subsidy, the annual maximum to be 6,000,000 pesetas.

Peru Plans Seaplane Service

Inauguration of a seaplane service on the upper Amazon was provided for in a supreme decree of Sept. 20, and approximately $250,000 was appropriated to be expended for this purpose in 1927. The service will function under the general supervision of the Ministry of Marine.

Equipment for the new service has not yet been selected. The overland trip to Iquitos requires from 20 to 30 days, whereas the plane service will cut the transit time to 2 or 3 days and will eliminate the hardships of mule and canoe travel. Travelers will continue to use the railroad between Lima and Oroya.

Seaplane Crosses Africa

One of the French Navy seaplanes, which left Berreskden, near Marseilles, on Sept. 12, reached Quilimane, on the shore of the Indian Ocean on Nov. 19, having crossed the continent of Africa at its widest part.

The seaplane skirted the Spanish coast to Dakar, near Cape Verde and then followed the Niger River inland, proceeding across Africa along the main waterways. Upon reaching Majungo, Madagascar, the seaplane will return by way of Lakes Nyassa and Tanganyika, where it will be joined by the second plane, which was obliged to remain at that point. The two planes will return to France by way of the Nile Valley to the Mediterranean.

There were several unique points about this flight, as this was the first time the continent of Africa had been crossed by a seaplane at its widest part. It is believed also to be the longest flight yet made by a seaplane, and the first time France has been joined by air with Madagascar.

America and Air Transport

Urgent Need of Regular Passenger Air Transportation Facilities in the United States is Emphasized by Experience in Round-World Trip

By LINTON WELLS

MR. AVERAGE Citizen, if he gives the airplane any thought at all, is firmly of the belief that these United States, being its birthplace, lead the World in aircraft production and operation.

He will indicate with pride the efficient performance of the government transcontinental air mail service and its thirteen privately operated "feeder" lines; the feats of the Army and Navy air services; and, perhaps, boast of a ten-minute "joy-ride" which he has taken.

That is all right—as far as it goes. But the very facts mentioned justify the establishment and efficient operation of commercial air routes, connecting every important city in this country.

The real pioneering in aviation is over; the airplane as a safe, sane, speedy and reliable passenger, mail and freight-carrier is an accomplished fact. Its development has been a long and arduous process, but the performances previously mentioned and the fact that in Europe thousands of air miles are daily being traveled by thousands of people with only very infrequent mishaps emphasize the need in this country of the development, as rapidly as possible, of an extensive air transportation system.

On June 16, Edward S. Evans, Detroit business man and sportsman, and I left New York City on the first leg of a 20,000 mile race around the World against time. One of the motives which caused us to attempt this record-breaking fest was to prove that the airplane can be utilized as a safe and expeditious method of transport, not only over country where air routes are being operated regularly, but also over the remote, almost inacessible, sections of the globe which aircraft can bring into contact with the outside world. And we proved it.

Used Air Method to Cross Europe

From the moment—3:50 p.m. June 22—when we left the Le Bourget airdrome at Paris until we landed safely at Omsk, Siberia, Evans and I were almost constantly in the air, roaring across country after country in luxuriously appointed enclosed airplanes. In good weather and bad, we maintained a speed slightly in excess of 100 m.p.h., traveling almost 3600 miles in 35 hr. flying time.

Between Paris and Moscow we flew over air routes in regular daily operation, secure in the knowledge that, should any mishap occur which might necessitate a forced landing, there were other planes at our command which would reach us within an hour or so. Leaving Moscow at dawn June 24, we began a dangerous flight over hitherto unflown territory.

Top left, Edward S. Evans (left) and Linton Wells leaving Pasco, Wash. for Salt Lake City in one of the Whirlwind engined Swallow mail planes of the Varney Air Mail service. The pilot (rear cockpit) was L. D. Cuddeback. Below, Evans (left) and Wells at Rantoul, Ill., about to leave for Mitchel Field, N. Y. in an Air Corps plane. Right, Linton Wells (left) and Edward S. Evans greeted at Mitchel Field by J. H. Mears, the previous record holder, after their Round-the-World trip.

There were 2100 miles of territory to be spanned, with only two possible landing places, if we were to overtake the Trans-Siberian train which had left Moscow 30 hr. prior to our departure. The flight was completed successfully in 2 . hr. flying time, our train connection made, and a five-day period of rest allowed us.

Another comfortable flight was made between Harbin and Mukden, Manchuria, in a plane provided by Marshal Chang Tso-lin, the Manchurian War Lord, and we were able to continue on schedule by train.

Before leaving the United States we had chartered a large airplane for a transcontinental flight between Seattle and New York. We had every confidence in this machine and fully expected to reach our finish point in from 30 hr. to 32 hr., possibly less, thus establishing a record of 27 days 12 hr. for the entire trip.

Unfortunately, this plane was forced down at Chicago while en route to Seattle to meet us. A radiogram to this effect was handed me about 11:00 p.m., July 9. The next day was Saturday, a half-holiday; then came Sunday and we were scheduled to reach Seattle about 6:00 a.m., Monday, July 12, which we did.

At the time Evans and I were notified that no airplane would be awaiting us at Seattle we were not in touch with a single plane nearer than New York which could be trusted to fly us over the 3000 miles which remained to be covered after we landed on American soil. Radiograms were dispatched to every owner of any type of airplane within a radius of 1000 miles of Seattle, to the Army Air Service and the Air Mail Service. We requested Eddie Stinson to leave Northville, Mich., and fly as far westward as he could in the short time at his disposal.

When we reached Victoria, B.C., at dawn July 12 we learned that the Army Air Corps had come to our rescue and ordered two planes to Seattle to fly us through to New York. Walter T. Varney, who operates the air mail route between Elko, Nev., and Pasco, Wash., agreed to fly us from Pasco to Salt Lake City. Harris M. Hanshue, head of the Western Air Express, flying the mail between Salt Lake City and Los Angeles, had wired that Capt. C. C. Moseley, general manager of this line, was in Salt Lake City prepared to fly us to Cheyenne or North Platte by daylight. Between North Platte and New York City there was no air transportation available, unless Eddie Stinson should get through, which he eventually did.

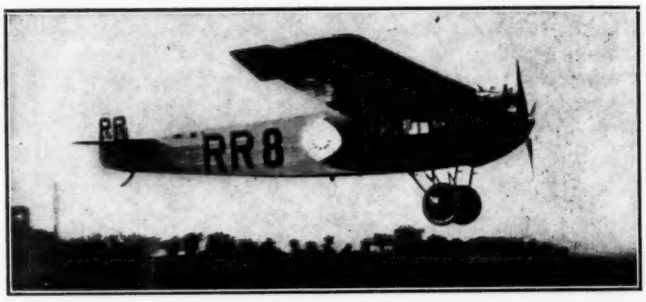
Employed Contract Mail Services

Upon landing at Seattle we learned that the Army Air Corps order had gone astray and the two planes we were expecting were not available. We, therefore, piled into two reserve planes and were landed at Pasco, Wash., in less than three hours. Varney came to our rescue there and carried us to Salt Lake City, where we arrived at 8:35 p.m., hours behind schedule. There we were met by Captain Moseley, ready to fly us to North Platte the next morning. Despite the fact that the air mail route is lighted every twenty miles between Salt Lake City and North Platte there was no plane equipped for night flying available and we were forced to lose eight valuable hours waiting for dawn.

Six and one-half hours flying put us into North Platte shortly before noon the following day and there we were picked up by two planes of the Army Air Corps, which had been sent from Fort Riley, Kan. One was equipped to fly at night, the other was not. The result was that when we were forced to land for fuel at Rantoul, Ill., approaching darkness necessitated our laying over there until the next morning. We had been ordered to Fairfield, O., where two planes equipped for night flying were available. An attempt had been made at Omaha to flag us down for orders to proceed to Cleveland, where two planes had also been sent, but we did not see the flagging party. It hardly mattered, for the strong head winds we encountered would probably have prevented our reaching Cleveland, as they did our making Fairfield.

Nine hours more were lost at Rantoul, but at dawn we were again in the air and at 2:57 p.m. landed safely at Mitchel Field, Long Island. Little more than an hour later—4:06:05 p.m., July 14—we were at our starting point, in New York City, having circled the globe in 28 days 14 hr. 36 min. and 5 sec. lowering the previous record by one week.

The point of it all is this. We lost every minute of our scheduled time between Seattle and New York City. When we landed in the United States were exactly on schedule and had we been able to command commercial airplanes, as one is able to do in almost every section of Europe, we would have completed our race in the 27 days 12 hr. planned. But there were no commercial planes available, except over short stretches, and these were taken off their regular routes and



Evans and Wells leaving Moscow in a plane of the Duruluft air line for the 2100 mile flight across Russia and Siberia to Omsk.

chartered by us at an almost prohibitive price. Despite the fact that the Army Air Corps flew us more than two-thirds of the distance, it cost Evans and me more than $4000 to span this country by air.

As one government official wrote us, nothing in recent years has called the public attention to the inadequate air facilities of the United States as the difficulties which we experienced in getting across this country. Which, after all, was one of the points Evans and I hoped to make.

As an illustration of what our race actually accomplished, Evans and I have been advised by the Soviet Government of Russia that the long contemplated Trans-Siberian air route will be put into operation in the late Spring of next year. Our successful flight between Moscow and Omsk gave the Government the courage to send two airplanes across Russia and Siberia to Pekin a month after we made it. These two planes reached Pekin in less than four days and are now on the return trip, charting the route and laying out landing fields. In May of next year the traveler who desires to reach Pekin quickly can leave New York by steamer, disembark in England and a few hours later take off from the airdrome at Croydon, near London, and, in less than six days of comfortable flying, reach the Chinese capital; say, twelve days of travel from New York City. Going westward by train and steamer at least nineteen days would be required even though the distance be one-third less.

If such a service as this can be operated successfully, from standpoints of safety and reliability America, with its unexcelled facilities, must be served likewise. It can be. Business men in every section of the country are more than willing to prove the commercial worth of the airplane if only the public will have faith.

Airship Car for Use as Motor Boat

The Goodyear-Zeppelin Company, at Akron, Ohio, has under construction at present an all-metal airship car, so designed that it will be detachable from the envelop of the ship and can be used as a motor boat. It is being constructed for Army and Navy training airships.

The cabin-boat will be operated like a motor boat, except that the propellers will be above the water.

The car is specially designed for coastal use. In time of emergency it can be used as a surface craft and quickly attached again to the airship hull.

In case of an accident at sea, whereby the airship becomes disabled, the car would act as a boat. It is of duralumin construction throughout.

The de Havilland Hercules Air Liner

The New Imperial Airways Three-engine Air Liner for the Egypt-India Air Service

THE DE HAVILLAND Hercules, type DH66, is the first three-engined machine designed or manufactured by the de Havilland Aircraft Company of Stag Lane, London, England. It was produced to the order of Imperial Airways Ltd., to be employed on the Cairo-Karachi air route to be opened Jan. 1, 1927 and has a very high performance. It is an air liner in every sense of the term, special features being incorporated in the design to ensure the comfort of passengers, both as regards accommodation, quietness and ventilation. The cabin may be heated or cooled at will by means of a controlling lever. Dual control is, of course, fitted, and passengers may readily communicate with the pilots during flight.

Sound-Proof Cabin

The Hercules is a biplane of extremely clean design. The wing structure follows more or less orthodox lines and is of wood. The fuselage is made entirely of steel, with the exception of the cabin and cockpits, which are of wood enclosed in the steel fuselage structure. The whole is covered with fabric. the cabin having an additional thick "walling" of a special sound-proof material. A large luggage compartment is provided. The cabin is 16 ft. 6 in. long and 6 ft. 5 in. high by 4 ft. 3 in. wide and accommodates 14 passengers. Gasoline is carried in twin tanks in the top wing, right away from the engines, risk of fire being thereby greatly reduced.

The wing span is 79 ft. 6 in. the length 66 ft. and the height overall 18 ft. The weight fully loaded is 14,700 lbs. The Hercules is fitted with three Jupiter Mk V1 engines of 450 hp. each, the total power being 1,350 hp. This means that the climb is good, and that normally the engines will be run throttled for normal flying, thereby ensuring long life and minimizing the possibilities of trouble.

100 m.p.h. on Two Engines

The top speed is 130 m.p.h. With only two engines running the machine will fly at just over 100 m.p.h. In the extremely unlikely event of two engines stopping during flight, the Hercules, with full load, could, from a height of 4000 feet, reach an aerodrome 30 miles distant in calm weather. The normal cruising speed is 100 m.p.h., and at this speed, the range is 525 miles.

The three engines are started by means of a gas starter motor situated behind the pilot and operated from his seat. In the event of a forced landing in the desert on the India route, this starter engine is so arranged that it will drive the electric generator of the radio transmitter. The Hercules is fully equipped with radio apparatus.

Performance Figures

The following table gives the major particulars concerning the DH 66, together with the manufacturer's figures of performance:

Weight of plane empty	9,220 lb.
Paying load (excluding crew)	3,284 lb.
Weight fully loaded	15,100 lb.
Rate of climb at ground level	765 ft./min.
Climb to 10,000 ft.	21 min.
Speed at ground level	130 m.p.h.
Speed at 10,000 ft.	118 m.p.h.
Stalling speed	53 m.p.h.
Cruising speed	110 m.p.h.
Range	525 miles

Egypt-India Air Line Starts Jan. 1.

Plans for the inauguration of the Egypt to India passenger service have been completed, and the Imperial Airways, Ltd., expects to begin operations on Jan. 1, when three De Haviland 66's will fly from London to Cairo. The planes will go by way of Berlin and Warsaw to Constantinople and Aleppo. From Aleppo one of the planes, which will carry Sir Samuel Hoare, the British Secretary of State for Air, and Lady Maud Hoare will fly to Baghdad and from there by Basra to Karachi. The other two planes will fly across Syria and Palestine to Cairo. Weather conditions being favorable, the first plane will begin the regular service to schedule on Jan. 12.

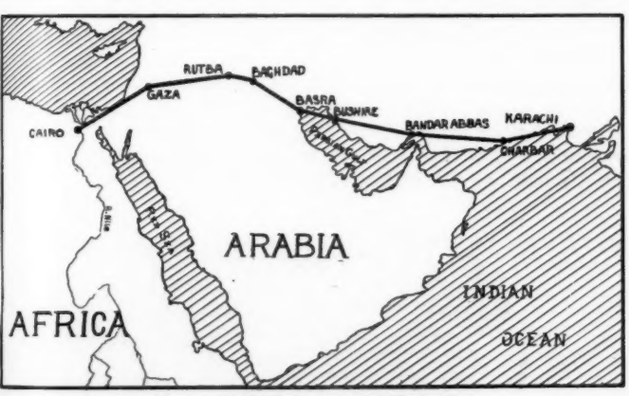
The planes to be used on this route will be three-engined de Haviland 66's, known as the Hercules type. They will be powered with Bristol Jupiter air-cooled engines (450 hp.),

The de Havilland 66 Hercules air liner (three Bristol Jupiter 450 hp. engines)

A side view of the de Havilland Hercules 14 passenger air liner (three Jupiter 450 hp. engines)

having 1,350 total horsepower and a full speed of 130 m.p.h. The planes are designed to fly with full load on only two engines. The Hercules weighs 15,100 lb. when fully loaded and can carry fourteen passengers. Seven passengers will be carried on this route, however, the remaining space to be used for freight and mail. A pilot, a mechanic-pilot and a radio operator will be carried in the planes, and on the Basra-Karachi portion, a second pilot will be carried.

Five planes will be used when full service is in operation, permitting a spare plane for emergency use at each end. Numerous landing fields, refueling stations, radio and mete-



The Imperial Airways air service route from Cairo to Karachi which is to open Jan. 1, 1927

orological bases are available along the route. The greatest distance between any two landing fields does not exceed 140 miles, and there are fields every 25 miles over the desert section. Especially constructed rest houses will accommodate passengers during the three nights of the trip through the desert.

Air travel will shorten the journey between England and India by seven days, and it will have a corresponding effect on mail. It takes fifteen days to transmit mail from London to points in India by steamer and rail. Until sufficient experience has been gained by those operating the line, passengers will be carried only as far as Basra. It is thought that a three months period will be necessary to gain this experience, after which the section from Basra to Karachi will be opened commercially, making a through route of 2,500 miles. It will take three days for the complete journey, the actual flying time being 31 hr.

There is a difference between the Imperial Airways route and the R.A.F. route, between Cairo and Karachi, as planes of the former will land at Ismailia to take mail and proceed to Gaza, where a new airdrome is under construction. The route from Gaza will be direct to Baghdad, missing the R.A.F. airdromes at Ziza, Amman and Ramadi. Rutba Wells, which is halfway between Gaza and Baghdad will be one stopping point. Large gasoline tanks are being installed at Rutba. This will be transported across the desert in motor trucks.

The time-table, as at present planned, provides for passengers boarding the planes at Heliopolis, Cairo, on Wednesday afternoons, stopping overnight at Gaza and reaching Baghdad early Thursday afternoon. Until full service is in operation, the passengers will remain at Baghdad on Thursday nights, go to Basra on Fridays, to Bandar-Abbas on Saturdays and Karachi on Sundays.

Lieut. Col. F. C. Shelmerdine, O.B.E., has been appointed by the British Department of Civil Aviation to take charge of the route for the Air Ministry. He will be stationed at Cairo and will be the civil air traffic officer, his duties to include flying periodically over the entire route.

The comparative figures of costs and time for air and land and water travel are given below:

		Fare by Air	*Fare by Rail and Water*	*No. of Days by Air from Cairo*	*No. of Days by Rail and Water from Port Said*
Cairo	-Gaza	$35.		½	1
Cairo	-Baghdad	205.	$160.	2	4
Cairo	-Basra	255.	190.	2	6
Cairo	-Bushire	295.	205.	3	8 or 13*
Cairo	-Bandar-Abbas	330.	240.	3	12 or 17*
Cairo	-Charbar	345.	275.	4	20
Cairo	-Karachi	360.	290.	4	15 or 22
Port Said-Karachi		—	$250.	10	
Port Said-Bombay		—	250.	15 (By rail from Karachi)	

*According to Sailings in the Persian Gulf.

P.R.T. Air Service Suspended

According to an announcement in *The Postal Bulletin* of Nov. 27, the contract air mail route No. 15, from Philadelphia, Pa., via Washington, D. C., to Norfolk, Va., and return was to be temporarily suspended on Nov. 30. This route is operated by the Philadelphia Rapid Transit Air Service.

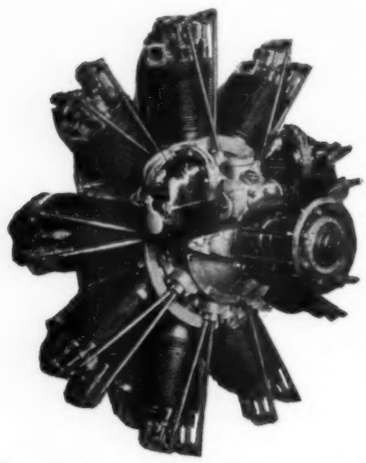
It will be recalled that this service began operations between Philadelphia and Washington on July 6, and on Sept. 15 the service was extended to Norfolk Va., carrying both mail and passengers. As reported recently in AVIATION, the service has maintained an efficiency of 97 per cent.

Do Airplane Engines Cost Much?

Aircraft Engines at $20.00 per Horsepower Compare Favorably with Costs in Other Fields

WHY ARE airplane engines so expensive? This is a question often asked, not only by the uninitiated but also by many aircraft manufacturers and operators. It is not strange that a unit price for an airplane engine of high horsepower should be relatively high. However, on a basis of comparison with other internal combustion power plants such as those used in the larger automobiles, the cost of the airplane engine shows up most favorably.

In making comparisons it is necessary that the two articles being compared should either be in the same class or that there should be some fair basis of comparison. This statement may seem only too obvious, but there are many people who compare the price of an aeronautical engine with the price of an automobile for instance, where there is no equality in either production quantity, horsepower or price.



The Wright Whirlwind 200 hp. air-cooled engine.

The primary functions of an aeronautical engine are to deliver the maximum power with the minimum weight, while embodying a maximum of dependability. Fuel economy is another important feature in the operation of an aircraft engine, because low fuel consumption means that less gasoline may be carried for a given flight, and due to the fact that a saving in fuel supply results in a greater payload capacity, it is most important. The goal to which all air transport companies are heading is to maintain equipment capable of carrying the maximum payload in pounds with the minimum cubic displacement of engine, resulting in the minimum cost per ton and passenger mile.

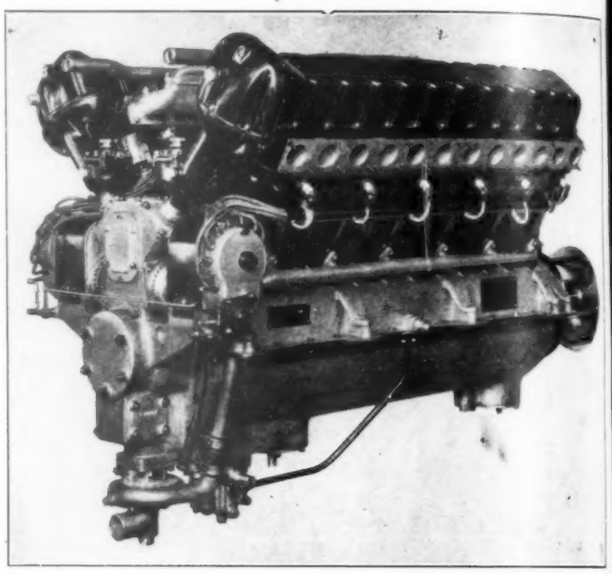
Specialized Aircraft Problems

When comparing the cost of an aircraft engine with other power plants we must take into consideration the problems that must be met by the aircraft manufacturers and operators. Many of these problems that must be overcome by the airplane engine manufacturers are not essential obstacles in the building of other types of gasoline engines, and yet, on the basis of cost per rated horsepower output, the aircraft engine compares most favorably.

A preliminary comparison may be made of the service demanded and rendered by airplane engines as against similar service in the high powered automobile field. A general motor overhaul for a car is usually required after 20,000 miles of use and a useful period of operation seldom covers more than 50,000 miles. In fact, a car that has been driven over 50,000 miles becomes somewhat of a curio, perhaps in more ways than one.

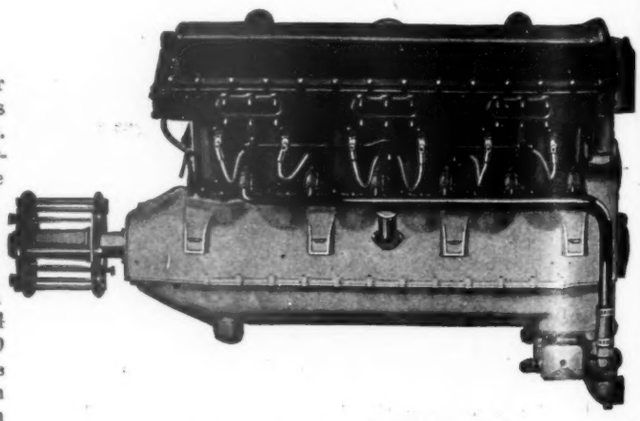
In a modern air-cooled aircraft engine the period of service before the first overhaul can safely be taken at 250 hr. or, at roughly 100 m.p.h., after 25,000 miles have been covered. Quite a number of air-cooled airplane engines have run for 300 hr. or about 30,000 miles, and here and there we find those that have turned out 40,000 miles before an overhaul was required.

The useful life of such an engine, depending of course on reasonable operating care, should be in the neighborhood of 850 to 1,000 hr., or 85,000 to 100,000 miles of service. The figures used above are by no means exceptional, as many aircraft power plants have shown such a service record and in some cases have even exceeded it. So, from the standpoint of miles of service the airplane engine compares most favorably.

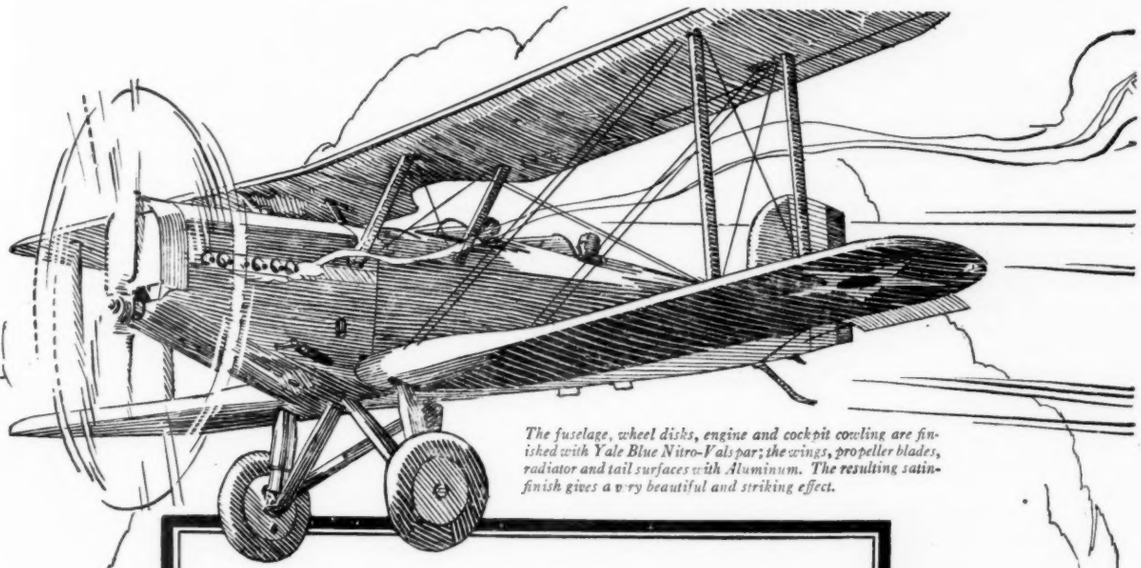


The Curtiss D-12 engine, 375-400 hp.

The comparison of cost per horsepower on the rated output of various types of power plants is most surprising. Stationary engines are built without any regard to weight and are usually enormously heavy for the power delivered. Size is of relatively little importance, whereas in airplane engines, weight and size are of the utmost importance, and, as a result, no stationary engine would be of much value in a heavier-than-air craft. On the other hand, stationary engines are expected to run for long periods of time, a quality in common with airplane engines. A good, high speed stationary engine, using gasoline as fuel, costs around $20 per horsepower, and a 20 hp. kerosene burning engine costs over $40 per horsepower. While neither diesel nor steam engines have any aeronautical counterpart as yet, their costs are interesting for comparison. A good steam engine costs around



The Packard 1A-1500, 500 hp. engine



The fuselage, wheel disks, engine and cockpit cowling are finished with Yale Blue Nitro-Valspar; the wings, propeller blades, radiator and tail surfaces with Aluminum. The resulting satin-finish gives a very beautiful and striking effect.

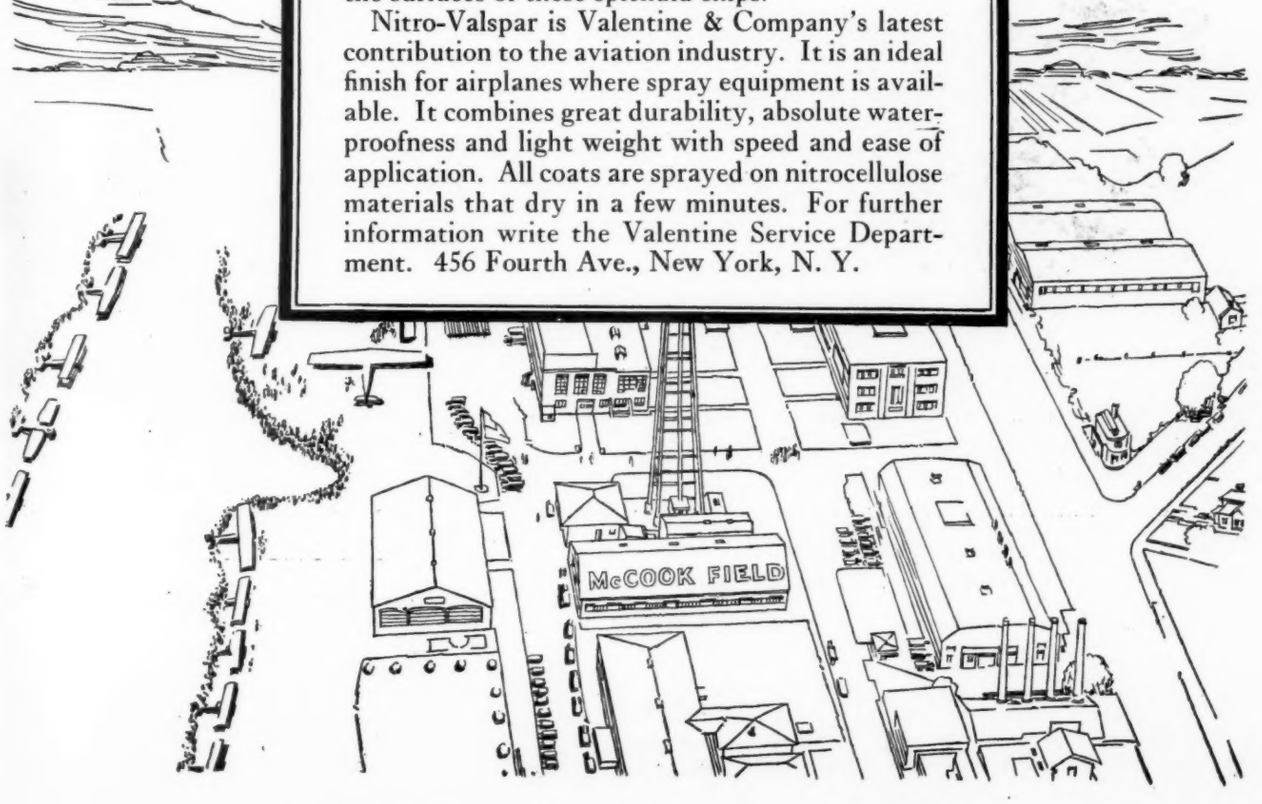
NITRO-VALSPAR

Serves the Flying Generals

FLASHING *Blue* across the sky, the two special Douglas observation planes recently built for the personal use of Major General Mason M. Patrick, Chief of the Air Corps, and Brigadier General James R. Fechet, are worthy of the service for which they were designed.

In keeping with modern ideas of construction and equipment, the Douglas Company chose Nitro-Valspar, the Valentine *all-lacquer* finish to protect the surfaces of these splendid ships.

Nitro-Valspar is Valentine & Company's latest contribution to the aviation industry. It is an ideal finish for airplanes where spray equipment is available. It combines great durability, absolute waterproofness and light weight with speed and ease of application. All coats are sprayed on nitrocellulose materials that dry in a few minutes. For further information write the Valentine Service Department. 456 Fourth Ave., New York, N. Y.

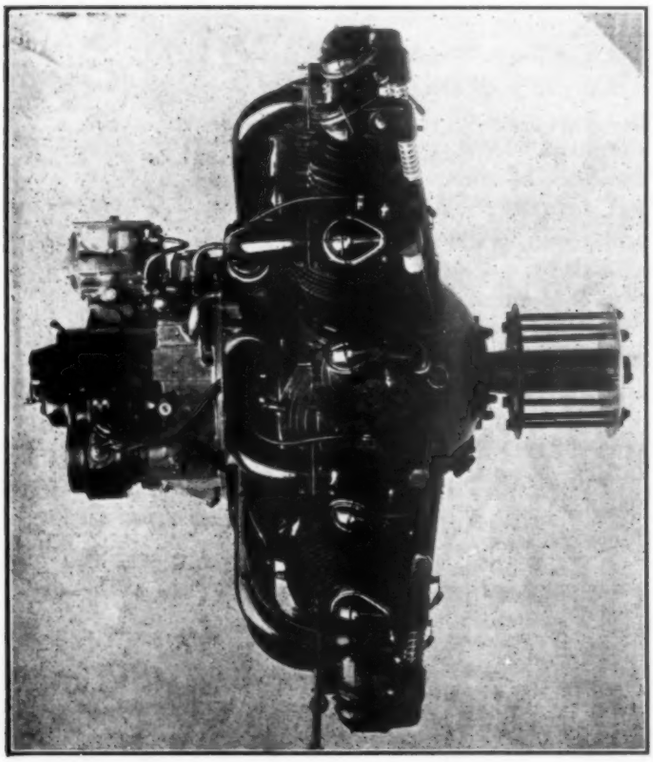


$30. per horsepower for the engine alone. The diesel type engine, using heavy oil, costs around $60 to $65 a horsepower and the semi-diesels from 20 hp. to 50 hp., sell at the same price—$60 per horsepower.

Internal combustion engines for marine use have been on the market for over a quarter of a century and they have now been completely adapted to the service for which they are intended. They are expected to give long service but are not usually called on to operate at full or nearly full power for long periods as are aviation engines. The stoppage of a marine engine is inconvenient but not specially dangerous. The same statement cannot well be applied to airplane engines and the makers of the latter have to exercise much more care than do manufacturers of the marine power plants.

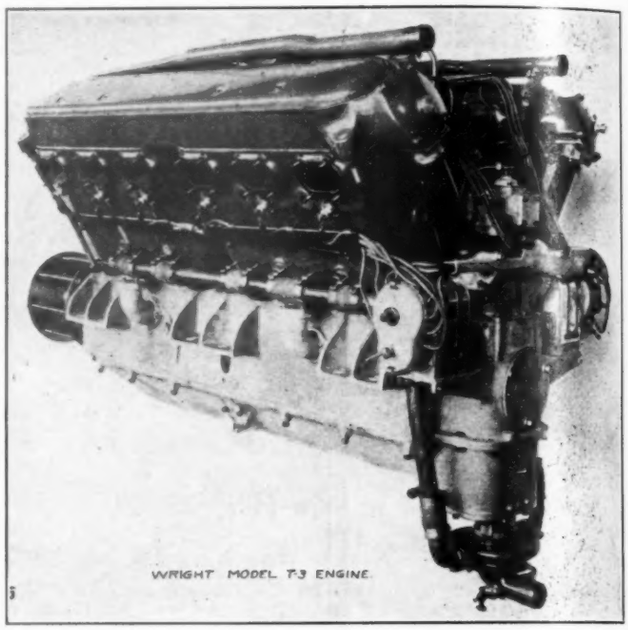
Marine Engine Comparisons

A well-known eight-cylinder, 280 hp. marine engine capable of 1,550 r.p.m. is sold at $20.70 per horsepower, and a six-cylinder 200 hp. marine engine of the same make sells for $26.50 per horsepower. Both the eight-cylinder and six-cylinder types of another popular marine power plant is sold at $33.33 per horsepower. There are many types of marine engines on the market and in most cases it has been found that the price per horsepower is approximately twenty dollars or over. The cost per horsepower of outboard engines for marine service is of some interest in making a general comparison. The one-and-a-half horsepower model of one of the largest manufacturers, costs $76.67 per horsepower, while the six horsepower engine of the same series costs $32.50 per horsepower.



The Pratt and Whitney Wasp engine, 400 hp.

When taken on the basis of cost per horsepower output, the automobile engine, with all the standardization, mass production and labor-saving devices developed, is, in some cases, more expensive per horsepower than an airplane engine! On the basis of the figures compiled, we find that a 100 hp. automobile engine would cost $3,280 or about $30 per horsepower. Automobile engines are the most common examples of internal combustion engines in use today, and it is reasonable to understand why airplane engines are compared with them most frequently. In making a comparison on a price basis, however, a new difficulty is experienced, namely the difficulty of determining a price for the engine alone. The price of the complete car is of no value at all. The six-cylinder engine of one of the best selling medium-priced cars developing 32 hp. at 2,200 r.p.m., costs, without the transmission, $32.80 per horsepower. It is easily seen, however, that a motor car engine is seldom, if ever, called upon to do 2,200 r.p.m. for more than a very short period of time, so that the normal S.A.E. rating of 25 hp. brings the cost to $42 per horsepower.



The Wright-Tornado engine

By way of further comparison, one of the best of the "eight-cylinder, in-line" automobile engines costs $30.20 per horsepower on the rating of the S.A.E. at 36.4 horsepower. According to the manufacturers rating, this engine is capable of much higher horsepower than the S.A.E. rating, as it is possible to run it up to over 3,200 r.p.m. Even at this peak of 80 hp., the price is $13.75 per horsepower.

Based on the comparison figures so far supplied, it may be seen that an airplane engine at the approximate cost of $20 per horsepower is not excessive. On the other hand, these airplane power plants are built to withstand far greater stresses than are the other engines. It is no longer unusual to hear that an airplane engine has passed a 50 hr. continuous run test at full throttle, or at an average speed of 1,900 to 2,100 r.p.m. In fact, in many cases, new engines for aircraft are subjected to the most rigid tests and inspection including three full-throttle 50 hr. endurance runs. Automobile owners know that they cannot run their motors at full speed for 50 hr. without experiencing some difficulty.

Labor saving devices, quantity production and standardization have done much to reduce the price of automobile engines, but the aircraft engine manufacturers have had neither the benefit of highly expensive, specially built labor saving machinery, quantity production or standardization, and yet this branch of the industry has made tremendous steps in the development of reliable, economical and moderately priced power units.

Mexico to Have Air Police

Mexico may establish an air service to detest smuggling along the Mexico-United States border, according to a report received by the Department of Commerce. The Director General of Customs is preparing to present to the Secretary of the Interior of Mexico plans for the acquisition of three planes equipped with machine guns and bombing apparatus.

Bohn Ring True Bearings are Standard in most every Airplane you see

BOHN Ring True Steel Back Babbit bearings were especially designed in cooperation with the Airplane Industry for duty in airplane engines.

BOHN ALUMINUM & BRASS CORPORATION

EAST GRAND BOULEVARD, DETROIT

The Navy PN-10 Flight

The proposed flight of the two Navy Pn-10's, from Hampton Roads, Va., to Colon, Panama, started Nov. 23, when Lieut. C. J. Connell, U.S.N., in command of plane No. 1, hopped off from the Naval Air Station, at 4:18 p.m., and Comdr. H. R. Bartlett, U.S.N., in plane No. 2, followed seven minutes later.

Courtesy, N. Y. Times

A map showing the progress made by the Navy PN-10 seaplanes in the flight to Colon, Panama.

The non-stop flight was planned as an endurance test. Six Navy ships patrolled the route at intervals. Each ship was equipped for repair work and carried gasoline and oil to replenish the seaplanes' fuel tanks, if necessary.

The PN-10 No. 1 carried, beside Lieutenant Connell, Skiles R. Pope, pilot, and John R. Roe, radio operator. In addition to Commander Bartlett, the PN-10 No. 2 carried Lieut. H. C. Rodd, Lieut. C. H. Seildhauer, and Machinist's Mate Charles J. Sutter.

The PN-10 planes are biplane tractor boat seaplanes, with two 500 hp. engines each. They are 73 ft. in wing span, 49 ft. in length and 16½ ft. in height. They were equipped with radio sets having a daylight range of from 250 to 400 miles over water. They were built and equipped at the Aircraft Factory, Philadelphia Navy Yard.

Two hours after the start the planes were reported thirty-five miles off Cape Hatteras, having flown 135 miles in that time. At 8:10 a.m., Nov. 24, the planes were reported 250 miles South of Cuba. The exact course after reaching Cuba, was not determined at the start of the flight, but it was later decided to cross the Island and fly direct, rather than take the alternative route to the West around Cape San Antonio and Cape Corrientas. The former route was somewhat shorter.

A few minutes after the planes were reported at this position, word was received that Commander Bartlett's plane, the PN-10 had been forced down at Neuvea Geroana, on the North Coast of the Isle of Pines, and the PN-10 No. 1 was missing. Commander Bartlett, of PN-10 No. 2, reported his trouble as caused by a shortage of lubricating oil, and was arranging to resume his flight when it was called off, pending a search for Lieutenant Connell's plane, which had been missing eleven hours before it was located by the cruiser Cincinnati.

Upon receiving word that the PN-10 No. 1 was missing, the Navy Department ordered twenty-four warships to conduct a search, while vessels were rushed from Nicaragua, Cuba, Honduras, Florida and the Canal Zone.

The PN-10 No. 1 was found at 9:35 p.m., having been forced down by a broken connecting rod on its starboard side.

Lieutenant Commander Bartlett spent Nov. 25 resting and preparing for the resumption of the flight. The PN-10 No. 1 was towed to Guatanamo Bay for repairs.

At 6 a.m., Nov. 26, the PN-10 No. 2 hopped off from Siguana Bay, Isle of Pines, and after eleven hours thirty-six minutes of continuous flight, landed at Coco Solo, submarine base, Colon, at 5:36 p.m. At 3:25 p.m., the airplane tender Swan, 120 miles from Colon, reported the plane passing over in a heavy rainstorm. At 3:40 a radio message from the plane said the fliers expected to land at 5:15 and would like to be hauled out immediately. Two SC planes left the base at 4:14 to escort the PN-10 No. 2 into the harbor.

Thirty miles from Colon, the PN-10 No. 2 caught sight of the Isle of Grande about 5:30 o'clock. During this stretch of the flight, weather conditions were favorable, except for the storm which occurred during the last hundred miles. An average speed of 75 m.p.h. was maintained and an average altitude of 1,000 ft. The radio and engines worked perfectly.

German Super-Zeppelin Under Construction

Despatches state that the construction of Germany's new Super-Zeppelin is progressing rapidly. Dr. Hugo Eckenor, who is supervising the construction, and who will command the ship when it is completed, has partially disclosed the secrets of the new propulsion system which will be installed.

According to Dr. Eckenor, the power will be supplied by five 420 hp. Mayback engines, specially designed to burn a fuel known as carbonated hydrogen, with the chemical formula CH4. It is claimed this fuel is lighter and more efficient than either, gasoline or benzol. When exploded in the cylinders, one of the products of this fuel is a water vapor, which, passing through the exhausts, condenses in tanks, providing ballast and water to replenish the cooling system.

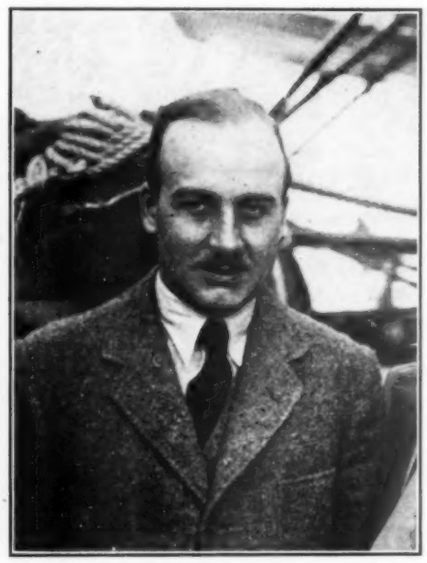
The exhaust water will compensate for the loss of weight from fuel consumption and will dispense with the necessity for wasting valuable inflating gas when ascending to high altitudes. The use of this carbonated hydrogen for fuel will cut down by thirty-five per cent the weight allowance for fuel and will correspondingly increase the initial useful load carried by the ship.

The two PN-10 seaplanes (twin Packard 1A-1500, 500 hp. engines) of the Panama flight before leaving the Naval Aircraft Factory, Philadelphia, Pa.

Seattle, Washington

Sir Alan Cobham in America

On Thursday, Nov. 25, Sir Alan Cobham, the well-known British long-distance pilot, and Lady Cobham arrived in this country from England on board the S.S. Homeric for a lecture tour, during which Sir Alan will describe his numerous flights and experiences.



Sir Alan Cobham

It so happened that, at the same time that the Cobhams were coming to the United States, a de Havilland Moth airplane (Cirrus, 75 hp. engine) was being sent to this country, consigned to Kenneth B. Walton, of Philadelphia, Pa. It was, therefore, planned that Sir Alan Cobham and Lady Cobham should leave the Homeric at Quarantine and fly in the Moth to the Battery. While the Moth is, in its original form, a land plane, it was, on this occasion, equipped with metal pontoons and was lowered over the bow of the Homeric to the surface of the water from which the flight was to have been made. The water, however, was extremely choppy and it was found impossible to take the little Moth off, in spite of her

Kenneth B. Walton's DH Moth (Cirrus, 75 hp.)

excellent flying qualities and the fact that her engine was functioning perfectly.

Sir Alan and Lady Cobham, therefore, were obliged to arrive at the Battery by motor launch, towing the little DH Moth. They were met by a reception committee of the Aeronautical Chamber of Commerce headed by Major Lester D. Gardner and including, Samuel S. Bradley, C. M. Keys, Otto Praeger, and W. L. LePage. Kenneth B. Walton was also at the Battery to meet the Cobhams, together with Capt. Christopher, who, together, planned to fly the Moth to Miller Field.

Broad Gage Advertising

The first of four unusual advertisements appeared in the last issue of AVIATION. In this series, the president of a company producing a commercial plane which has proved to be one of the best in its class, devotes the first three advertisements to the merits of competing manufacturers. In the fourth he expresses the thought that his own company will receive that share of the business created by other good planes which the excellence of his own product may warrant.

This advertiser's theory, which AVIATION believes is the right one, is that each sale of a reliable commercial plane brings nearer the day when airborne traffic will occupy the place in our transportation system which has always been accorded increased speed coupled with reliability.

Goodwill, cooperation, a 'one-for-all-and-all-for-one' attitude, a well knitted community of interest among the manufacturers of commercial planes—all well established planks of modern business—should be more a part of the code of the aircraft manufacturers than in the past.

This, we take it, is the thesis of J. Don Alexander, president of Alexander Aircraft Co., whose signature appears under the advertisements mentioned. It is one that AVIATION feels will accomplish great good if adopted by all the varied interests committed to the advancement of flying in the United States.

Professor von Karman's Lectures

The Daniel Guggenheim Fund for the Promotion of Aeronautics, Inc., announces a series of lectures by Professor von Karman on the Modern Development of Aerodynamic Theories, at the New Museum Building, Tenth and B Streets, N. W., Washington, D. C.

The first of these was held Dec. 3 and covered Laws of Air Resistance. The second, held Dec. 4, was devoted to Boundary Layer and Skin Friction.

Prof. von Karman

The balance of the schedule is as follows: Dec. 6, 10:00 a. m., Theory of Light; Dec. 10, 10:00 a. m., Theory of Induced Drag; Dec. 11, 10:00 a. m., Theory of Induced Drag; Dec. 13, 10:00 a. m., Simplified Theory of Air Screws.

Japanese Air Mail Starts

On Oct. 9 regular air mail service was inaugurated between Osaka, Japan and Shanghai, China. The seaplanes used in this service are of Japanese design and construction and are powered with German engines of 260 hp.

Need we say more?

NEW YORK HERALD TRIBUNE BOOKS, SUNDAY, NOVEMBER 7, 1926

Winged Books

CONQUERING THE AIR: THE ROMANCE OF THE DEVELOPMENT AND USE OF AIRCRAFT.
New York: Thomas Nelson and Sons.
AIRMEN AND AIRCRAFT: AN INTRODUCTION TO AERONAUTICS.
By Henry H. Arnold.
New York: The Ronald Press Company, $3.50.
TRANSPORT AVIATION.
By Archibald Black.
New York: Simmons-Boardman Publishing Company.

Reviewed by
FRANK E. HILL

THE writer, allured by aviation, is safe only if he sticks to history. Yet though the history of flying in the United States has been covered in a compilation present and future dominate its past. crop of aeronautical enthusiasts adventure up to

ere are all to ter. Mr. Wiladable of the valuable. It standpoint, covers in far better History of Mr. Wilnalistically e devotes erous re- a scant However, accounts ing and for his

of flyth an and hapter is

devoted to the future. All his material has appeared in other books or in recent articles, but the volume gives a readable summary of flying activity up to date, which, even if superficial, offers something new to any one looking for the most up-to-the-minute account of aerial activity.

Major Arnold's "Airmen and Aircraft" is more amateurish as a piece of writing. It is not well integrated—it mixes history, descriptions of machines, accounts of army and navy training of aviators, short biographies of famous aviators, and remarks on the dependability and use of aircraft. An appendix contains sections on airplane nomenclature, qualifications for air pilots, information about courses in flying, etc. It is the book of a man who has a great deal of interesting and miscellaneous information but cannot tell all he knows nor tell well what he does succeed in giving.

Mr. Black's book is by far the most solid contribution of the three. It is capable of being read by the general reader, but its virtues are organization and information rather than style. The author is an engineer, and he has produced an engineer's idea of a popular but informative book. Business men interested in aerial activity can find in it facts about air transport here and abroad. The legal, physical and financial conditions surrounding commercial flight are clearly outlined. Twenty-six tables supply a mine of information on everything from Appropriations for Civil Aeronautics to Engine Troubles in Air Transport Operation. There is a chart showing how an aerial transport company should be organized, and one can learn why the cost of operation with cargo is 2.145 cents for a certain type of plane.

Mr. Black's book, in its comprehensiveness and clarity, has a definite excuse for being, and if frequently brought up to date might hold its field as a useful book of reference for experts and semi-experts. However, it should be read with the realization that new inventions may soon make necessary the revision of the whole plan of the book. This is not Mr. Black's fault, and in the meanwhile he has stabilized existing experience and knowledge in a creditable manner.

Which Open Only at One

The Chapter Headings

Introduction
Scope and Coordination of Air Transport
Air Transport in Foreign Countries
Air Transport in the United States
Factors Governing the Development of Air Routes
Possibilities of the Airplane in Transport
Influence of Design Upon Operating Costs
Engines for Transport Airplanes
General Requirements of Transport Airplanes
The Design of Passenger Airplanes
The Design of Freight and Mail Airplanes
Airways and Landing Fields
Landing Field and Maintenance Equipment
The Cost of Maintaining Engines in Air Transport
The Cost of Maintaining Transport Airplanes
Air Transport Organization and Personnel
Air Transport Investment and Operating Cost
Reliability of Airplanes in Transport and Appendix
Appendix—Tabulated Data on American and Foreign Airplane Engines and Transport Airplanes

254 pages, 107 illustrations, 5 1/2 x 8 1/2, $3.00 net, postpaid

The Author, Archibald Black, is one of America's foremost aircraft engineers. He was formerly Consulting Engineer of the United States Air Mail Service. In 1925, he was Chairman of the Aeronautic Division, American Society of Mechanical Engineers. For the past sixteen years Mr. Black has gathered together facts, figures and information of the commercial airplane and put them all in this book. The scope of this work will astound all those who read it. As one reviewer of the manuscript aptly put it, "Mr. Black's book will go down in air history as the pioneer cyclopedia of air transportation.

JUST MAIL THIS COUPON TO-DAY →

Simmons-Boardman Publishing Co.

30 Church Street, New York, N. Y. — Book Department — London, S. W. 1, 34 Victoria Street

SIMMONS-BOARDMAN

SPECIAL ORDER COUPON

Simmons-Boardman Publishing Company,
30 Church Street, New York, N. Y.
34 Victoria St., S. W. 1, London

Please send me a copy of Transport Aviation by Archibald Black for which I enclose $3.00.

NAME .....

ADDRESS .....

CITY .....STATE.....

POSITION .....COMPANY.....

Postage prepaid to retail purchasers in U. S. and Canada only.
Av. 12-6-26

Side Slips

By ROBERT R. OSBORN

The news tells of a mysterious airship being built in England for experimental flights to India and elsewhere. From the article, we read the ship will accommodate a hundred passengers, will be 730 ft. long, and will have a lounge and a dining room and "kitchens capable of serving a six course dinner." This report is somewhat disappointing as we expected that the kitchens would be at least large enough to serve a seven-course dinner. We think this provision should be made even if it involves adding another thirty feet to the ship.

The reporter tells us, too, that the ship will have two decks connected by an electric elevator. For some reason, having an elevator to save walking one flight reminds us of a hotel in New Orleans having a roof garden which is reached by a taxi. This peculiar roof garden is two miles away from the hotel and is elevated about two feet from the ground.

It seems that quite an air of secrecy is being thrown about the ship and when it was inspected by the Dominion Premiers, in London for the Imperial Conference, "even they were not shown the secrets of its navigating and driving machinery". Having been bored to tears time after time when we were being shown all the secrets of the machinery in a gas works, spinning mill or boiler factory, and having observed the same futile and harassed look in the eyes of outsiders to whom we are demonstrating the secrets of aeronautical machinery, we'll bet that the Dominion Premiers were able to bear up bravely when they found that the secrets of this machinery would be denied them.

• • • •

Everything is not as bad in an aeronautical way in America as it may have seemed lately. The French may have taken our landplane speed and altitude records and the Italians may have taken our Cup and seaplane speed record—but all is not lost as yet. We still have the first six electric stoves to have been delivered by airplane.

• • • •

The eleven-year-old New York boy who wrote to the Secretary of the Navy suggesting better air defense, was recently rewarded by being taken for a ride by a prominent civilian pilot. We hope that this bright boy will appreciate how lucky he is. Most of the other critics of our air services have been rewarded with "rides" which weren't quite so pleasant—in fact some of the unfortunate gentlemen are still walking back.

• • • •

Recently we had an opportunity of observing some materials being tested in one of the large eastern airplane factories, and, while we hesitate about making this column too technical and scientific in its discussions, we think these particular tests are interesting enough to mention. When new material is submitted to this company for test, the Assistant Chief Engineer, who weighs possibly a hundred and ninety pounds, places it alongside his desk and jumps on it five or six times. Then it goes to a man in charge of materials and standards, who borrows a hammer from the nearest workman and spends half an hour or so trying to batter the material into some other shape than the original one. Satisfactorily surviving both of these tests, the new material is placed in the stock room, and the company continues to use the same materials as before.

• • • •

Of course, it may have been an error on the part of the "make-up" man, but we might as well allow full credit to the editor of a large New York newspaper for accomplishing something which, heretofore, seemed impossible. An issue of his paper recently had an automobile accident in large headlines on the front page, and an airplane accident, correctly reported in all details, amongst some advertising on the fifth page.

B B T

LANDING FLOODLIGHT
AIR MAIL TYPE

Produces intense illumination of five hundred million candle power over a half-mile area.

Sharp cut off at the top of the beam prevents blinding the pilot and assures safe night landings.

Easy and economical to operate.

May we tell you more about the light every modern airport will eventually require?

B.B.T. CORPORATION OF AMERICA
ATLANTIC BUILDING PHILADELPHIA PENNA.

FLYING EDO BOATS

Manufacturers of

DURALUMIN FLYING BOATS, PONTOONS, WING FLOATS and SKIIS

EDO PONTOONS FITTED ON WACO 9

EDO AIRCRAFT CORPORATION
COLLEGE POINT, L. I., N. Y.

AIRPORTS AND AIRWAYS

Boston, Mass.

By Daniel Rochford

Never has this city seen as much ground work going on for the sake of transportation by air. Proposals involving the moving back of the Airport hangars to a line near the developed East Boston ground and the leveling off and cindering of the whole Airport area for a flying field, is the major movement and is backed by all the different air organizations and committees of the state.

The Chamber of Commerce may be able to come to the rescue of night fliers by spending the $3,000. left over from the Airport funds of 1922 to run a cable light and power line to the present hangars to which the Army and National Guard will connect their equipment. A sub-committee of the Chamber of Commerce Aviation Committee, consisting of Robert T. Fisher, chairman, Frank W. Merrick, and Godfrey L. Cabot, has been named to meet with representatives of the Municipal Air Board, the Department of Public Works, the Edison Illuminating Company, and the War Department to complete the details and carry them out.

There is no difficulty with Airport management as far as the operations at the field are concerned. The present arrangement is perfect. The Army, through the Airport commander, supervises the field. But the airport is open to all commercial, military, naval, and private fliers on equal terms subject to the reasonable and necessary safety control by the Airport commander.

However, it is impossible to develop the airport as it must be developed without a consolidation of interests there. Today the State owns the land and leases to the federal government which operates the runways. The city simply looks on. Last year the state refused to provide funds for repairing the runways and extending them. The city gave $10,000. Yet the city has no legal right to spend money without a special legislative act.

The problem is this: The fliers want the whole area turned into flying field. They do not care whether the State or Boston owns the land the field is on. The Government should run the field as they do now. But will it be easier to have the State spend the money to make a real flying field there suitable for more than one plane to land on at a time? Or is it easier to get the state to sell it for a nominal sum or lease it for a long term of years to the City, so Boston can spend the money to develop it?

Theoretically the latter course is preferable. Airports are community assets just as harbors are. Yet an airport like that of Boston is a State asset too, as the Boston harbor is.

This problem is concerning the groups named above and some definite program may be expected within a few weeks. State-wide air action is planned by the Massachusetts American Legion Aviation committee of which Capt. R. F. Raymond, D.S.C. is active chairman. This committee held its first meeting recently without publicity. Capt. A. Raymond Brooks, D.S.C. and an official War Ace, now with the Department of Commerce, has just completed an exhaustive survey of the Boston-New York route and is working on the advance plans for Boston-Albany, Boston-Maine, and the Massachusetts Airways plan for the American Legion. He

A *FOKKER* Reliability Tour

Commander Byrd's FOKKER TRIMOTOR, after completing the 1925 Ford Reliability Tour with a perfect score, flying subsequently 15,000 miles between various cities, from New York to Cuba and return and then to the North Pole, has just completed *a tour of 8,800 miles around the United States.* 45 cities were visited on the trip from New York to San Diego via Chicago and San Francisco, returning to New York via New Orleans and Pensacola, Fla. Flying exactly to schedule, the trip was completed in 46 days.

Total mechanical difficulties and *replacements to airplane—nil.*

Total mechanical difficulties and *replacements to three Wright Whirlwind engines—one valve spring.*

"An airplane of the highest possible degree of dependability"

ATLANTIC AIRCRAFT CORPORATION
Factory & Flying Field
Hasbrouck Heights, N. J.
Cable—Atlair, Hackensack, N. J.

FOKKER AIRCRAFT CORPORATION
110 East 42nd Street
New York City, N. Y.
Cable—Fokplanes, New York.

made his preliminary report at the Legion committee's meeting this week.

Washington Irving Bullard helped himself to the controls of Colonial Air Transport's first three engined Fokker twelve-passenger monoplane when flying over New York City on a demonstration flight last week. The new plane is a modification of the Byrd Polar plane but looks much the same. The pilot's cockpit has been moved forward giving more cabin room.

The plane will come to Boston on Dec. 7 or 8 carrying Gen. John F. O'Ryan, who is to be the guest of the Boston Chamber of Commerce. At that time Boston will learn what its immediate air future is to be as regards Colonial operations.

Colonial intends to bid for the Chicago-New York mail contract. Bids will be opened Jan. 15, 1927. Win or lose, Colonial expects to fly New York to Chicago via the northern route, Albany and the Lakes. If they get the contract they will try to have the course run north to avoid the Pennsylvania mountains and to include the great manufacturing cities of their northern route. If they do not get the contract they will offer to carry mail on their transport routes.

Chicago, Ill.

By Otto Klein

In spite of the approaching holiday season, the Heath Airplane Company continues to enroll students. There are at present forty-six students on the company's flying list, and instruction is being given every day in the week. Clifford Condit, who has been chief instructor for the past year, is leaving, however, and R. C. Mossman, who has been flying a plane of his own on the South Side, is taking his place. Albert Meyer also instructs for the Heath Company.

E. B. Heath, president of the Heath Airplane Company has left for the South, after an illness of several weeks.

The Chicago Aeronautical Service, who have been very active in the commercial field during the year, are now featuring their flying school. Ed LaParle, well known pilot in this part of the country, is chief instructor. This company has a number of fine airplanes and is well equipped to teach flying.

William Mast flew his Canuck to St. Charles a few days ago, but was forced to land in a plowed field, much to the amusement of the near-by farmer who will undoubtedly charge ten dollars for the use of his team of horses. Wonder why the N.A.A., like automobile clubs, doesn't provide free towing service for stranded airplanes?

White Field, Hudson Falls, N. Y.

Ralph Pease, Leon Beaumont and Gordon Sturtevant have been busy lately, working on the Jenny they have been rebuilding. Pease has just purchased another Jenny which they will rebuild this Winter. They are storing Vic Richard's Standard and TM Scout. Vic has gone to Florida after a very successful season carrying passengers, doing photographic and advertising work and giving flying instructions.

Leon Bleumont is thinking of buying an OXX-6 Aeromarine. Several others around here are contemplating buying planes so that flying activities should be booming around here next Summer.

Casper, Wyo.

The Power River Flying Club, which was recently organized, has divided its membership into four classes: resident, resident-associate, non-resident, and non-resident-associate members. To be a resident member, one must be a qualified pilot.

Plans are now under way for the erection of a hangar and club house on the Wyoming Airways, Inc. field, on the Salt Creek Highway. The club house will be used as an air station by visiting Army officers and pilots and will provide a meeting place for those taking lecture courses and training work in the aviation school.

The main reason for the formation of the flying club at this time is to have a working organization to present plans and proposed activities to members of the state legislature, in order to impress them with the importance of aviation to Wyoming.

The twenty-eight charter members of the club are: J. T. Scott, Mayor of Casper, A. R. Kellogg, J. Don Alexander, C. A. Church, F. M. Cole, Geo. Anderson, E. C. Delgrade, H. C. Oldham, G. D. Leigar, Don Phillips, D. P. Wardwell, Walter Storre, Dick Leferink, William Cutter, R. V. Garrett, Jack Davis, R. L. Cropsey, C. S. Allen, D. F. Kearney, Judd Walker, R. Richard Robinson, E. W. Henderson, Frank Blehr., Jack Steele, Lieutenant Commander Osgood, R. C. Tarrent and Mike Williams.

On Armistice Day the club staged an air meet at the Wyoming Airways, Inc. field which marked the beginning of their aviation activities. There were six visiting planes: three Army planes from Denver, two commercial planes from Denver and one commercial plane from Wichita.

Lieut. Paul Vernier, piloting an Eaglerock, won first place in the precision landing competitive event and also received the highest award for stunt flying. The Eaglerock landed inside the 90 ft. circle within 10 ft. of the center. Lieut. Dan Kearns, of the Colorado National Guard, in an Army plane, secured second place, making his descent within 43 ft. of the center. Lieut. Louis W. Goss, also piloting an Army plane, came within 75 ft. of the center. winning third place.

John Green, in a Travel Air, won the 12 mi. free-for-all race, making the distance in 7 min., 45 sec. Lieutenant Vernier took second place in this race, his time being 8 min., 24 sec. Lieut. Carlos Reavis, of the Colorado unit, finished third, in 9 min., 12 sec.

A. R. Kellogg, of the Alexander Aircraft Co., of Denver, and Walter Beech, of the Travel Air Mfg. Co., Inc., of Wichita, were present during the air meet.

Capt. Armin F. Herold, commander at Willard Field, Salt Lake City, carried passengers during the morning and afternoon and "Dare-Devil" Duncan entertained the four thousand on-lookers by a parachute jump from Dick Leferink's plane when it had reached an altitude of 2,000 ft.

During the evening there was an informal reception at the home of Walter Storre for visiting officers and other out-of-

(*Continued on Page* 972)

James Montee, veteran flier, who recently visited Mitchel Field, after crossing the country by air. He did not sustain his apparent injuries while flying.

PRIVATE OPERATORS made the discovery that airplanes engineered to meet the exacting requirements of the **POST OFFICE DEP'T.** were more economical to keep up and operate than many so called, "Commercial Ships."

Considering that the initial cost was no higher, it was well worth their time investigating the superiority of **RYAN M-1.**

RYAN M-1 MAIL PLANE OVER SAN DIEGO, CAL.

RYAN AIRLINES — SAN DIEGO.

Roebling

AIRCRAFT WIRE
STRAND AND CORD, THIMBLES AND FERRULES

John A. Roebling's Sons Co.
Trenton, New Jersey

FERDICO AVIATION
LIQUID MARINE GLUE

Elastic
Durable
Tenacious

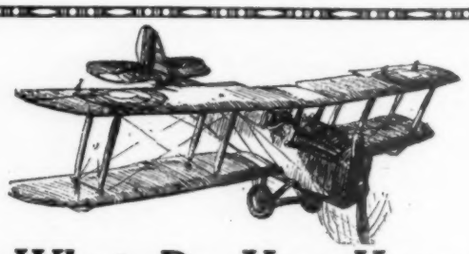
Ferdico

Permanent
Resilient
Waterproof

Most perfect Marine Glue ever produced for pontoon construction
WRITE FOR INFORMATION AND SAMPLE.

L.W. Ferdinand & Co.
152 Kneeland Street, Boston, Mass.

When Writing to Advertisers, Please Mention AVIATION



What Do You Know About Airplanes?

A FEW years ago men had to learn about aircraft from personal, costly experience. They had no one to guide them—no one to point out mistakes when they were made—and therefore years were spent learning what takes months now.

THOROUGH — PRACTICAL TRAINING

Today the American School of Aviation offers you these long years of experience and knowledge, which cost millions to acquire, in their new and fascinating Home Study Course in Practical Aeronautics which has been highly endorsed by prominent aviation authorities.

WRITE TODAY

No matter whether you have worked with airplanes all your life or are just beginning in the industry you owe it to yourself to send for a complete and detailed outline of this training and our new and interesting free book, "Opportunities in the Airplane Industry."

American School of Aviation

Dept. 8259

3601 Michigan Ave., CHICAGO, ILL.

The Purpose of the

National Aeronautic Association

is to

MAKE AMERICA FIRST IN THE AIR

In this effort it merits and invites YOUR cooperation and support

Regular Membership $5.00 per Year

National Headquarters

1623 H. Street, N. W., Washington, D. C.

Perry - Austen

COMMERCIAL

Acetate Nitrate **DOPES** Clear Pigmented

No. 21 Pigmented Eggshell Finish-Nitrate Spray or Brush 2 coats over clear Acetate or Nitrate. Fuselages and wings. Lustrous AUTOMOBILE-like finish. Very attractive, smooth and easy to keep clean.

Perry - Austen Mfg. Co. - Staten Island - N. Y.

Contractors to United States Government

(*Continued from Page* 971)

town guests and about eighty officers and friends attended the dinner at the Townsend Hotel previous to the dance given by the reserve officers at the Elks Hall.

Among the twenty-six qualified pilots in Casper, one is a woman, Mrs. W. M. Morris, who has 180 hr. in the air to her credit.

United States Air Forces

Mitchel Field, L. I.

Flood lights, edging the field and illuminating the whole space set aside for airplane landings, will be installed next Spring at Mitchel Field, according to an announcement from the Army Air Corps.

At a cost of $7,600 a series of flood lights will be placed around the flying field in such a manner that the entire field can be illuminated.

Designation of Air Depot Changed

The depot of Ft. Armstrong, T. H., formerly designated as the Air Depot, will in the future be known as Air Section, Hawaiian General Area Depot, in accordance with orders issued Nov. 4 by the Adjutant General's Office, Washington.

Pilot Relays Distress Call

A Naval pilot from the Pensacola station, recently while flying, picked up and relayed a message from a tug which was foundering twenty miles off the coast of Florida. This is believed to be the first case of its kind.

When the message reached the station, the owners of the tug were notified, but the tug sank before help could reach it. The crew was subsequently rescued.

Plane Lands With Missing Wheel

Boatswain Tony Feher, attached to the Naval Air Station, Hampton Roads, Va., with Commander Douglas as passenger, in an Aircraft Squadrons, Scouting Fleet UO-1 landplane, recently made a spectacular landing on the station flying field.

Feher lost a wheel in taking off at Langley Field and indicated his predicament by circling low over the station field. The station crash boat was prepared, expecting him to land in Willoughby Bay but, instead, he made a low wing landing on the cinder road of the flying field without any injury to the personnel and comparatively slight injury to the plane.

Tony has now qualified for membership in the famous "One Wheel Club".

Amphibian Planes Recover Torpedoes

A report has been received from VJ Squadron One to the effect that the amphibian planes have proved to be ideal for use in torpedo recovery work. They have a considerable range of speed, and can be on station with very little loss of time and are able to throttle down during actual chasing so as to stay with the torpedo during its run.

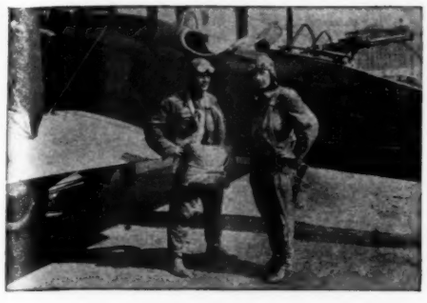
This plane was also used to determine its suitability for anti-aircraft towing. It was proven that this type plane tows a standard anti-aircraft sleeve with 7,000 ft. of wire at rehearsal altitude of 6,000 ft. without any difficulty.

Air Concentration at Joint Army-Navy Maneuvers

The greatest concentration of aerial fighting forces in the country's history, will mark the joint Army-Navy Maneuvers in the Narragansett Bay area which start the middle of next May.

More than two score aerial fighting craft will accompany the Battle Fleet when it leaves its bases on the Pacific on Feb. 19. The formidable armada of 67 surface fighting ships will operate for three months with the Scouting Fleet in Atlantic waters.

(*Continued on Page* 974)



Lieut. Doolittle, with Lap Pack type; Lieut. Brookley, with Seat Pack type — IRVIN Air Chutes.

In the Service of U. S. A.

They think nothing about it now. These men of the Army Air Service. They step easily into their "IRVIN" harness before going up. And then as they sit comfortably with the "pack" attached, they forget it entirely. Yet it's ready for instant use—if they need, or want it. And it gives them that confident feeling of "ready for anything". Likewise with the U. S. Navy and U. S. Air Mail services.

Manufactured by

Irving Air Chute Co., Inc.
523 Main Street
Buffalo, N. Y.

Cable Addresss "Irving, Buffalo"

AIR CHUTES IRVIN TRADE MARK

SAFETY RECORD

—Of Alexander Aircraft Co. pilots in 1926 shows

1121 FLYING HOURS
95285 MILES FLOWN

All without serious accident

ALEXANDER EAGLEROCK

"Performance with Economy"

DEALERS WITH DEMONSTRATOR SHIPS ON THEIR FIELDS

Southern California—Aero Corporation of California, Los Angeles
Northern California—W. L. Lamkin, Porterville, California
Michigan—Niles Airways, Niles, Michigan
Indiana—Captain J. A. Yonge, Gary, Indiana
Illinois—Sievert Aircraft Corp., Chicago
Oklahoma and Texas Panhandle—Southwest Airplane Sales Corp., Oklahoma City
Virginia and North Carolina—J. S. Charles, Richmond, Virginia.
W. Missouri and E. Kansas—Bennett Eaglerock Sales Co., Kansas City, Mo.
E. Missouri and Arkansas—Bridgeton Aircraft Corporation, St. Louis, Mo.
N. Y. and Conn.—G. Torlotting, Curtis Field, Garden City, N. Y.
W. Kansas—C. E. Steele, Dodge City, Kansas
Wyoming and Montana—Wyoming Airways, Casper, Wyo.

CASH PRICE—$2475—DENVER

ALEXANDER AIRCRAFT CO.

ASSOCIATED WITH ALEXANDER INDUSTRIES
ROOM 401, ALEXANDER INDUSTRIES BLDG. DENVER

GOODYEAR

Everything in Rubber for the Airplane

The Goodyear Tire & Rubber Company, Inc.
Akron, Ohio

METEORPLANE

WORLDS FIRST LIGHT PLANE

IRWIN AIRCRAFT CO.
Established 1908
SACRAMENTO CALIFORNIA

THE BEST THAT MONEY CAN BUY IN A COMMERCIAL TRAINING SHIP

$2,250. $2,250.

A HESS PRODUCT MEANS A STRONG ONE

"Quality and Strength at Low Cost"

HESS AIRCRAFT CO.

Sales Office
WYANDOTTE, MICHIGAN

NITRATE DOPE

NEW PRODUCTION **IMMEDIATE SHIPMENT**

Contractors to U.S. Army and Navy

VAN SCHAACK BROS. CHEMICAL WORKS
3358 AVONDALE AVE. - CHICAGO, ILL.

(*Continued from Page* 972)

Augmenting this air force will be the squadrons from the Scouting Fleet and formidable array of Air Corps machines that the Army will utilize.

Final approved plans for the Battle Fleet for the first six months of the next calendar year provide for its basing on San Pedro from Jan. 1 to Feb., holding anti-aircraft practice, long range battle and night battle practice and visual signal competitions. On the latter date virtually the entire fleet sails for the Canal Zone holding fleet tactics en route and arriving Mch. 4. Joint Army and Navy exercises of a minor nature staging an attack on the Army defenses will be held there and on Mch. 10 the fleet will sail for Guantanamo for the fleet concentration.

Marine Designations Changed

Changes in the designations of the principal two Marine aviation units have been announced by the Marine Corps Headquarters.

Under the order, the aircraft unit stationed at the Marine Barracks at Quantico, Va., which heretofore has been known as the First Aviation Group, after Sept. 1, is to be called Aircraft Squadron, East Coast Expeditionary Force.

The unit at the Naval Air Station at San Diego, Cal., hitherto called the Second Aviation Group, is designated Aircraft Squadrons, West Coast Expeditionary Force, after Sept. 1.

Army Air Orders

Sec. Lieut. Benjamin Robert Padgett, Jr., Air Corps Res., Brooks Field, to Atlanta, Ga., to revert to inactive status.

Following officers of the Air Corps Res., at Brooks Field, to their homes as indicated, reverting to inactive status upon arrival: Sec. Lieuts. Charles Stark Draper, Palo Alto, Cal. and Arthur Edward Larratt, Billerica, Mass.

Following officers, Air Corps, relieved from further duty and training at the Air Corps Prim. Fly. School, Brooks Field, and are attached to Second Division for duty: Sec. Lieuts. John O. Taylor, Newell E. Watts, William B. Hawthorne.

First Lieut. John E. Upston, Air Corps, Bolling Field, to Washington.

Sec. Lieut. Rowland Kieburtz, Air Corps, Langley Field, to Brooks Field.

Navy Air Orders

Lieut. Arthur S. Billings det. Nav. Air Sta., Pensacola, to U.S.S. Pennsylvania (VO Sqd. One) Aircf. Sqdns., Battle Fleet.

Lieut. William J. Walker det. U.S.S. Pennsylvania (VO Sqd. One), Aircf. Sqdns., Battle Fleet, to U.S.S. West Virginia.

Lieut. (jg) John L. Pratt det. U.S.S. Raleigh, to Nav. Air Sta., Pensacola.

Lieut. Leslie C. Stevens det. U.S.S. Langley, to Bur. Aero.

Lieut. (jg) Hugh W. Hadley det. USS Pennsylvania, to temp. duty USS Chewink.

Ensign Albert Handly det. USS Idaho, to temp. duty Nav. Air Sta., Pensacola.

Ensign Sidney King det. Nav. Air Sta., Pensacola, to USS Wright.

Lieut. Clarence A. Hawkins det. Nav. Torp. Sta., Newport, to Obs. Plane Sqd. 6, Aircraft Sqd., Setg. Flt.

Lieut. Merritt P. Higgins det. Nav. Air Sta.. Pensacola, to USS New York.

Lieut. Emil H. Petri det. USS Wright to Nav. Air Sta., Pensacola.

Lieut. (jg) Charles W. Crawford det. VS Sqd. One, Aircraft Sqdns., Setg. Flt., to Nav. Air Sta., Pensacola.

Lieut. Charles E. Bauch det. Nav. Air Sta., Lakehurst, N. J., to USS Los Angeles.

Lieut. (jg) Bates H. Johnson det. VS Sqd. One, Aircraft Sqdns., Setg. Flt., to Nav. Air Sta., Pensacola.

Now—lighter tie rods for internal bracing

By an exclusive Macwhyte process of cold-rolling and drawing we have developed a round tie rod with standard thread diameters and reduced diameters in the center section—a tie rod lighter in weight with unusual strength. Permits absolute adjustment. Made in accordance with Government specifications. Same strengths as Streamline Tie Rods. Ask for full details. Macwhyte Company, 2909 Fourteenth Ave., Kenosha, Wisconsin.

MACWHYTE
Streamline & Round
TIE RODS

ALEXANDER AIRCRAFT CO.
Performance with Economy
DENVER, COLORADO

OFFICE OF THE PRESIDENT — Dec. 6, 1926.

Aviation Readers:

There's a firm headed by Jake Moellendick in Wichita that has been building good Swallows for many years, in fact they are among the oldest light commercial builders in this country.

My friend Jake and his crew deserve a lot of credit for sticking to the ship in the determination to overcome all obstacles and make America first in the air.

Every time they sell one of their rugged Swallows, its flier becomes a booster for flying and sells about six more on the idea. Some of the six may buy Eaglerocks or other good ships.

Go to it Jake, you are a good sport and you deserve to prosper.

With a smile,

J Don Alexander

President.

ALEXANDER INDUSTRIES

Who's Who in American Aeronautics

PUBLISHED BI-ANNUALLY

THE BLUE BOOK

OF

AMERICAN AIRMEN

Contains One Thousand Biographies of

Aviators, aeronauts, aeronautical engineers, aircraft manufacturers, flying officers of Army, Navy and Marine Corps, Air Mail personnel, aircraft accessories manufacturers, flying field owners, American aces, aeronautical instructors, inventors, National Guard air officers, aeronautical writers, sportsmen, men prominent in aeronautical affairs.

TWO HUNDRED ILLUSTRATIONS

PRICE — TWO DOLLARS

GARDNER PUBLISHING COMPANY
225 Fourth Ave., New York

Enclosed please find Two Dollars for copy of Who's Who in American Aeronautics.

Name .....

Address .....

City .....

Where to Fly

CALIFORNIA

THE RYAN SCHOOL OF AVIATION

O. B. STAR ROUTE SAN DIEGO

Ideal flying weather all Seasons. Very best of planes and instructors. Opportunity to study latest planes and construction.

A few recommended students will be given employment in our shops, while learning to fly.

CONNECTICUT

NEW ENGLAND AIRCRAFT CO., INC. New England's largest, most complete airdrome, of 96 acres. Commercial flying service. Complete flying instruction. Inter-city passenger and light express service by appointment. Advertising, photography. Our rates are reasonable and we make commercial pilots. Waco 9 distributors for New England.

805 MAIN ST., HARTFORD, CONN.

FLORIDA

Modern planes for any purpose, at any time. Rates reasonable. Flying schools located at Atlanta, Ga., Daytona Beach and Tampa, Fla., where you can fly in comfort in any season. South Eastern Distributors for Swallow Airplanes.

Address all correspondence to A. B. McMULLEN COMPANY
15 PEACHTREE ARCADE, ATLANTA, GA.

IDAHO

WALTERS FLYING SERVICE
BOISE, IDAHO

COMPLETE FLYING INSTRUCTIONS AND GROUND COURSE
Learn to Fly at High Altitude—then you can fly any place

ILLINOIS *Only 50 miles west of Chicago*

EAGLE AIRPORT SCHOOL OF AVIATION.
Herman J. Neubauer, M.D.
Hinckley, Ill.

Learn to Fly at our up-to-date school at very reasonable prices. Complete ground and air course. Come any time. Ideal accommodations for students. Expert instructors. Write for information.

ILLINOIS

MID-WEST AIRWAYS CORPORATION
MONMOUTH, ILLINOIS.

Complete flying instruction and ground course. Large safe field and good airplanes. Distributors for the new Waco airplane.

ILLINOIS

HEATH AIRPLANE COMPANY, Inc.
Oldest aeronautic establishment in U. S.

Airplane Supplies Flying School
2856 Broadway Chicago

ILLINOIS. **YACKEY'S CHECKERBOARD FLYING FIELD.** *Operated by the Yackey Aircraft Co., one of the oldest flying schools in the U. S.* The Yackey Aircraft Co. is conducted by men who have made a success in all branches of flying before the war — — in the war and after the war — — U. S. Army, U. S. Air Mail and Civilian. You can only learn from one who knows. You only know from experience. We have proven our ability. YACKEY AIRCRAFT COMPANY, Forest Park, Illinois.

ILLINOIS Campbell De Schepper Airplane Co., Inc.

Best equipped commercial field in the middle west. 24 hour service with night flying equipment and used by N. A. T. mail line Chicago to Dallas. A limited number of students accepted for training at reasonable rates. We invite cross country pilots to make use of our facilities.

Mail address 515-18 ST., MOLINE, ILLINOIS.

ILLINOIS Pal-Waukee Airport & Service Station. *Distributors of new Swallow Airplanes.* The Field with New Equipment. Chicago's new and most modern airport, four-way field, 2200 X 1200 ft., hangars, shops and supplies. Board and room near field. Located on Milwaukee Ave. at Palatine Road, 20 miles northwest of Chicago loop, 5 miles north of Des Plaines, Ill. Convenient and courteous service to visiting pilots. Pal-Waukee Airport, *P. O. Address* Mount Pleasant, Ill.

KANSAS

ALLISON AIRPLANE CO. *Winter Flying Instruction.* Special rate $100. Room and board $8 a week. Modern planes only used here. Commercial and sport planes at attractive prices. Our factory gives training in airplane construction and an opportunity to assemble your own plane from parts and save money. LAWRENCE KANSAS

MARYLAND LOGAN FIELD

CHESAPEAKE AIRCRAFT COMPANY, Headquarters Armory, Baltimore. Passenger and express service. Aerial photography and advertising. Flying school $250. for course. No bond for solo. *Agents for TRAVEL AIR Planes, Maryland, Virginia & District of Columbia.* Phone Vernon 3760.

MICHIGAN

NILES SCHOOL OF AVIATION

Guaranteed course of instruction in flying. Enroll at any time. No bond for solo flight. Become an expert pilot under expert instructors.

NILES AIRWAYS NILES, MICHIGAN.

MICHIGAN **LEARN TO BUILD AIRPLANES**
OVERCASHIER AVIATION SCHOOL

8 Arcadia Building, 3513 Woodward, Detroit, Michigan.
Please forward information on practical commercial aviation courses. X .....
Motor expert — Construction — Flying *Established 6 years*

MISSOURI

BRIDGETON AIRCRAFT CORPORATION
ST. LOUIS FLYING FIELD ANGLUM, MISSOURI

Thorough flying instructions by the hour or complete course. Ground and air work given by competent instructors. Only new planes used. A personal interest taken in each student.

DISTRIBUTORS OF THE NEW WACO AIRPLANE.

MISSOURI

MUNICIPAL FLYING FIELD. Rates $15.00 per hour. Come when you can and stay as long as you like. Can use a few students to work out part of tuition. No extra charge for oil or gas. Board and room $8.00 per week. All instruction is personal and no charge for ground school or learning to taxi. *Write* LEE R. BRIGGS, MEMPHIS, MO., *for further particulars.*

MISSOURI

NICHOLAS-BEASLEY AIRPLANE CO. Complete flying instructions, by hour or by complete course, primary, cross country, advance training, solo. New ships and new motors. Instructors who take an interest in you. No deposit required on solo flight. Write for full particulars. **MARSHALL, MISSOURI.**

MISSOURI

LEARN TO FLY! *ONLY $100.* Our instructors of long experience, our modern training airplanes, and the best flying field in the Middle West make us the best equipped school in the country to teach you to fly properly. *Enroll Now.*

PORTERFIELD FLYING SCHOOL, *Richards Field,* Kansas City, Mo.

NEBRASKA

LEARN TO FLY at the LEXINGTON SCHOOL of AVIATION
LEXINGTON, NEBRASKA

Complete flying course $175.00 or $20.00 per hour, no charge for ground school. Taxi service 20c per mile any where, any time. We fly new planes only. Distributors for Swallow airplanes.—G. R. MORTON, *President*

NEW YORK

CURTISS FLYING SERVICE INC., GARDEN CITY, N. Y. Complete Flying Service including Instruction, Aerial Photography, Advertising and Passenger carrying. Fast cross country transportation at a moment's notice to any point with either land or water types. Air fleet of thirty machines. Flying the year round. *Big reduction in rates for Flying Instruction. Write for information.*

NEW YORK

FLYING SCHOOL—Operated in connection with our shops assuring a Liberal Knowledge of Design and Construction at no additional expense. Competent Instructors. *Reliable Machines.* Passenger Flights and Cross Country Service. Write for Details. **AERIAL SERVICE CORP., HAMMONDSPORT, N. Y.**

OHIO

JOHNSON FLYING SERVICE
DAYTON, OHIO

GRADUATES OF OUR SCHOOL HAVE A REAL ADVANTAGE
A Flying School of Distinction. Write for Further Particulars

WHERE to FLY

CONTINUED ON FOLLOWING PAGE

Where to Fly

CONTINUED

OHIO

INDIAN LAKE AVIATION COMPANY
RUSSELL'S POINT, OHIO.

Learn to fly for $125.00 at Indian Lake, Ohio's million dollar playground. First class at this price, starting Nov. 1. We are in our seventh successful season of training and passenger work.

OREGON.

FLY IN THE NORTHWEST.

RANKIN SCHOOL OF FLYING - 408 Oregon Building.
PORTLAND, OREGON.

PENNSYLVANIA — *PITTSBURGH*

PITTSBURGH-McKEESPORT AIR PORT — 9 miles from business center of Pittsburgh; 2 miles from business center of McKeesport; Fast Interurban Cars past field. *A splendid fourway field — Look for our big circle.* Eastern Distributing Point for Swallow Airplanes. *Office address,* 504 STANDARD LIFE BLDG., Opposite P. O., PITTSBURGH, Pa. *Visitors Cordially Welcome.*

PENNSYLVANIA

PITCAIRN AVIATION, Inc.
Land Title Bldg. Philadelphia.

4-way flying field, largest in East, on Doylestown pike, above Willow Grove.

4 instructors, ideal flying country, busy field, reasonable board. Our flying course includes meteorology, map-reading, etc. Waco, Standard, Oriole and Jenny airplanes available for graduate students at low rate. No liability bond required.

WRITE FOR BOOKLET.

TEXAS Year-round Flying

SAN ANTONIO AVIATION & MOTOR SCHOOL
Expert instruction in flying and mechanics
Free sleeping quarters at Airdrome
AIRPLANES, ENGINES, PARTS, SUPPLIES, SHOPS, HANGARS, OX5s, Hissos, Liberties, Jennies, Canucks, Standards
Large stocks on hand, prompt shipment, best values.
Office 509 Navarro Street San Antonio, Texas.

YOUR card, in this directory, serves to keep your flying service continuously before the readers of AVIATION at trifling cost.

Write for Rates

AVIATION

225 Fourth Avenue, New York City

INDEX TO ADVERTISERS

Advance Aircraft Co. ... 945
Aircraft Service Directory ... 980-981-982
Alexander Aircraft Co. ... 973-974
American School of Aviation ... 972
Arthur & Co., Wm. E. ... 981

B.B.T. Corp. of America ... 968
Bennett Eaglerock Sales Co. ... 981
Boeing Airplane Co. ... 965
Bohn Aluminum & Brass Corp. ... 963
Boston Newswriting Service ... 980
Box 522 ... 982

Classified Advertising ... 979
Crawford Airplane Co. ... 981
Curtiss Aeroplane & Motor Co., Inc. ... 948

Decatur Aircraft Co. ... 982
Detroit Aero Motors Co. ... 982
Dickerson Steel Co. ... 981

Edo Aircraft Co. ... 968

Ferdinand & Co., L. W. ... 971
Finch Aircraft Co. ... 982
Fischer & Jacobs, Inc. ... 980
Fokker Aircraft Corp. ... 969

Goodyear Tire & Rubber Co. ... 973
Grant Marine Motor Co. ... 980
Guggenheim School of Aeronautics ... 981

Hamilton Aero Mfg. Co. ... 980
Hartzell Walnut Propeller Co. ... 982
Haskelite Mfg. Co. ... 981
Hess Aircraft Co. ... 973
Huff-Daland Airplanes, Inc. ... 980

Ireland Aircraft, Inc. ... 981
Irving Air Chute Co. ... 973
Irwin Aircraft Co. ... 973

Johnson Motor Products Co. ... 980

Klamath Air Service Co. ... 942
Kreider-Reisner Aircraft Co., Inc. ... 981

Ludington Exhibition Co. ... 981

Macwhyte Co. ... 974
Martin Co., The Glenn L. ... 946
Meyrowitz, Inc. E. B. ... 970
Monumental Aircraft, Inc. ... 980

National Aeronautics Association ... 972
New Jersey Veneer Co. ... 982
Nicholas-Beazley Airplane Co. ... 980

Perry-Austen Mfg. Co. ... 972
Pioneer Instrument Co. ... 980
Pratt & Whitney Aircraft Co. ... 943

Roebling's Sons Co., John A. ... 971
Roosevelt Aero Service ... 981
Ryan Airlines, Inc. ... 971

Scintilla Magneto, Co., Inc. ... 947
Service Steel Co. ... 981
Simmons, Boardman Publishing Co. ... 967
Southern Airways, Inc. ... 980
Standard Oil Co. ... 944

Titanine, Inc. ... 982

Valentine & Co. ... 961
Van Schaack Bros. Chemical Works, Inc. ... 973

Wallace Aero Co. ... 981
Where to Fly ... 976-977
Wies, Inc. Geo. A. ... 980
Wright Aeronautical Corp. ... 984

Yackey Aircraft Co. ... 980

When Travelling in Europe

TRAVEL

THE K.L.M. WAY

FROM

LONDON and PARIS

TO

ROTTERDAM, AMSTERDAM, HAMBURG
COPENHAGEN AND MALMÖ

K.L.M. STANDS FOR COMFORT, SAFETY
AND RELIABILITY ON ALL AIR JOURNEYS.

Special machines for trips over Europe always available

Joy-Flights Aerial Photography a specialty

KONINKLIJKE LUCHTVAART MAATSCHAPPIJ

- Royal Dutch Air Lines -

Head Office - THE HAGUE - HOLLAND

Cable address TRANSAERA

CLASSIFIED ADVERTISING

10 cents a word, minimum charge $2.50, payable in advance. Address replies to box numbers, care AVIATION, 225 Fourth Ave., New York.

New Erwin back pack parachute. Used only five times. Price $200.00. Jack Smith, Stamford, Texas.

FOR SALE: New M. F. boat with OXX6 motor, Reed propeller, natural finish and set up to fly, with motor $2500. Essington Aviation School, Essington, Pa.

FOR SALE: Curtiss Seagull, Loening air Yacht and Liberty motors. Curtiss Metropolitan Airplane Co., Port Washington, Long Island, N. Y.

BARGAINS: Avros complete, new condition, equipped with practically new 110 LeRhones; Avro parts, wings, tail groups, landing gears, etc. Sopwith Camels, new condition, equipped with practically new 80 and 110 LeRhones or Clergets; Complete sets of Standard E-1 wings, tail groups, struts, wires, etc. Overhauled guaranteed 110 LeRhones complete $50. All kinds of spare parts. Practically new OX5 motors, new model camshaft and valve action, guaranteed 110 hp. $200 each. Propellers for 80 and 110 LeRhones, 130 Clergets and OX5s, etc. Wanted: Avro fuselages and original Avro pontoons. Wehrman Aireraft Corporation, 48th Street and Palisade Avenue, Union City, N. J.

WANTED: Ten men who would like to earn part or all of their tuition through flying school. Send 25c to Box 502, Peoria, Ill., if interested.

EXPERIENCED ENGINEER, familiar with metal construction and design, desires connection. References. Box 517, AVIATION.

Hisso Jennie $600.00, OX5 Standard $475.00, three OX5 Standards, like new $750.00 each, Mercedes motor, slightly used, $175.00. Heath Airplane Company, Chicago, Illinois.

Short wing Canuck, enclosed motor and spinner nose, steel engine mounting. Ship like new in every detail. Motor turns 1400 on grounnd. $800. buys it. Wire Paul Braniff, Oklahoma City, Okla.

WANTED: Tent hanger for JN4 at once. Specify condition and price in first letter. We can supply your Jennie and OX5 wants. Pennsylvania Aero Service, Punxsutawney, Pennsylvania.

FOR SALE: Canuck, complete less motor. Two hundred seventy-five dollars ($275.00) bargain. Box 523, AVIATION.

FOR SALE: C-6 Curtiss Motor factory overhauled, Scintilla magneto, with new Hamilton propeller, real bargain. Lyons Motor Sales, 8027 Ogden Avenue, Lyons, Illinois.

Irvin parachute. Seat pack. Purchased in July. Absolutely perfect and like new. Cost $375. Will sell for $275. Chute now at Irving factory for inspection. Factory rebuilt and recovered OX5 Canuck. Natural finish, $675. A. Maguire, Curtiss Flying Field, Buffalo, N. Y.

FOR SALE: 1926 Waco, OX5 balanced ailerons, motor and ship flown less than ten hours. Hartzell propeller, dual control. Never damaged, always kept in hangar. Fly away. Old Orchard Beach, Maine, twelve miles from Portland. $1800. H. S. Smith, 199 Marlboro Street, Boston, Mass.

36 LETTERS
14 TELEGRAMS
22 PHONE CALLS

"and more coming"

A quick sale at full advertised price—

That was the experience of Art Arrowsmith, Kutztown, Pa., who used a short classified add in the Oct. 11 issue of AVIATION to dispose of a used Waco—a tribute to the resale value of the Waco and the extraordinary spread and pull of AVIATION advertising.

FOR RESULTS USE AVIATION ADVERTISING

AVIATION

225 4TH AVE., NEW YORK

FOR SALE: Curtiss JN4D, OX5 Hammondsport Motor, turns 1400 on ground. Ship redoped a beautiful silver, blue cowling. Ready to fly away. Instructions to purchaser free. Used only forty hours. Price only $850.00. J. T. Clawson, 2215 Grandview Avenue, McKeesport, Pa.

FOR SALE: Newly rebuilt and recovered DH6. Easiest plane in the world to fly. Can not Spin. $800.00. Double aileron JN6 with OX5 motor, new longerons and covering, perfect condition, $750.00. Regular Jenny OX5 motor, good condition, $650.00. Priced for quick sale. Wire. The Willard Parker Flyers, 2400 Euclid Avenue, Cleveland, Ohio.

THE Aircraft Service Directory

WHERE TO PROCURE EQUIPMENT AND SERVICES

RUNNING LIGHTS
PIONEER INSTRUMENT COMPANY
MAIN OFFICE AND FACTORY BROOKLYN NEW YORK
WASHINGTON 441 STAR BUILDING · PARIS 97 BOULEVARD SAINT MICHEL · SAN FRANCISCO 15 SPEAR STREET

TRADE **HAMILTON** MARK
PROPELLERS

Standard J-1 lower wings, $20.00 to $60.00 each. Upper wings, $50.00 to $100.00 each. Brand new Standard J-1 airplanes, complete with motor, $750.00 up. OX5 Parts. Water Pump Assemblies, $6.00. Exhaust Manifolds, each side, $3.50. Crank Case, lower half, $16.00. Intake Valves, $.30. Exhaust Valves, $.40. Largest stock of strictly commercial airplanes, motors, parts and supplies in the United States. Immediate Delivery. Our flying school is open the year around. Write for new catalog.
NICHOLAS-BEAZLEY AIRPLANE CO.
MARSHALL, MO.

BRAND NEW LIBERTY MOTORS
For Airplanes and Speed Boats
Spare Parts for Liberty and Hisso
GRANT MARINE MOTOR CO.
10435 SHOEMAKER AVE., DETROIT, MICH.

EXPERIMENTAL MOTOR WORK
We will rebuild any make of motor, or make or duplicate any part of a gasoline engine. We will work out any idea you may have on a motor. We will advise whether or not your ideas are practical. We will increase the horse power and R.P.M's. of any standard motor. We make special valve mechanisms for OX Curtiss motors.
FISCHER & JACOBS, INC. AUTOMOTIVE ENGINEERS
Chew Street above Chelton Ave., Germantown, Philadelphia, Pa.

AIRCRAFT SERVICE DIRECTORY
A Market Place for the Aircraft Industry.

WE invite the attention of both the experienced Air Mail contractors and those contemplating new express mail, and passenger routes, to our single and multi engined convertible, land or seaplane types of
TRANSPORT PLANES
HUFF DALAND AIRPLANES, INC.
475 Fifth Ave., NEW YORK. *Factory*, BRISTOL, PA.
"Specialists in U. S. Air Service Bombardment Planes"

New
— LIBERTY MOTORS —
WITH ALL THE LATEST IMPROVEMENTS.
CAN SUPPLY FROM STOCK ANY NEW "LIBERTY" PARTS DESIRED.
WRITE OR WIRE FOR PRICES.
JOHNSON MOTOR PRODUCTS, Inc.
518 West 57 St., New York.

CLOSING OUT OUR DALLAS BRANCH
New and slightly used Curtiss JN4Ds and Hs, and Standards.
Name Your Own Price.
We are reserving twenty of these ships for our School at San Antonio. Everything else goes.
Schools and Dealers lay in your supply now.
Inspect at Love Field, Dallas, Tex.
New and used Hisso and OX5 Motors and parts.
Wholesale and retail. Everything for the flyer.
SOUTHERN AIRWAYS INC.
210 COLLEGE ST. SAN ANTONIO, TEXAS

BOSTON NEWSWRITING SERVICE
Publicity and advertising in Boston and New England newspapers by men with active newspaper knowledge and contacts. Aviation accounts handled personally by Daniel Rochford, aviation editor, Boston Evening Transcript. Ceremonies arranged and carried out. Consultation free. Temporary or year round service basis. Address all communications to
DANIEL ROCHFORD
G.P.O. BOX 2433 BOSTON, MASSACHUSETTS.

TRAVEL AIR AMERICA'S FOREMOST COMMERCIAL AIRPLANE
Sold in New York, New Jersey and Pennsylvania *by*
GEO. A. WIES, INC.
Hangar 192 Linden Avenue
Curtiss Field Mineola, New York

This Section Is Growing With Every Issue

YACKEY TRANSPORT
Liberty 12 motor. Landing speed is 32 miles per hour, high speed 125 m.p.h.; useful load 2400; ceiling with load 22,000 ft., duralumin construction throughout. Best performing ship ever known. Price $7,500.00.
Yackey Aircraft Co., Yackey's Checkerboard Airplane Field
DesPlaines River & Roosevelt Road FOREST PARK, ILL.
(Suburb of Chicago)

AIRCRAFT SUPPLIES
Recent additions to our stock of wide variety and large volume of standard and utility aircraft materials and motor parts now enables us to give you prompt and efficient service.
Send for Catalogue No. 3. Special quotations on quantity orders
MONUMENTAL AIRCRAFT, INC.
1030 N. Calvert St., Baltimore, Md.

AIRCRAFT SERVICE DIRECTORY

CONTINUED

EVERYTHING FOR THE AIRPLANE
Send for Our Catalogue
LARGEST AIRPLANE SUPPLY HOUSE IN THE WEST
A complete line of parts and accessories for aircraft at lowest prices.
A money-back guarantee on everything sold.
WRITE OR WIRE US YOUR REQUIREMENTS.
CRAWFORD AIRPLANE COMPANY
"Masters of the Air."
350 WASHINGTON BLVD. VENICE, CALIFORNIA

HASKELITE PLYWOOD
Only Plywood made to pass strict Grade "A" Navy Specifications.
Can be furnished in any size or thickness.
HASKELITE MANUFACTURING CORPORATION
133 W. WASHINGTON ST., CHICAGO, ILL.

Air Spec. 10225D
SEAMLESS STEEL TUBING
Complete Warehouse Stock for Immediate Shipment in any Quantity.
SERVICE STEEL CO. 1435 Franklin St. DETROIT, MICH.

LUDINGTON EXHIBITION COMPANY
Passenger Flying
Instruction
Victor Dallin—
Aerial Photography
AGENTS FOR WACO NINE
Spares of All Kinds
Sport Farman Ships
Aerial Taxi Service
Exhibition Flying
Office: Atlantic Bldg. PHILADELPHIA
Flying from Pine Valley Field PINE VALLEY, N. J.

DIRECTORY ADS BRING RESULTS

Ask Our Advertisers

Daniel Guggenheim School of Aeronautics
Courses in Aeronautical Engineering and Industrial Aviation. For particulars apply to the Dean of the College of Engineering,
N. Y. University, University Heights, New York, N. Y.

Actual Size
SEND ONE DOLLAR
We will send you by return mail a beautiful pair of sterling silver wings mounted on bar pin with safety catch, also identification card issued by National Flyers Ass'n. These pins are being worn by thousands of aviators, aviation mechanics and boosters.
WALLACE AERO CO., Bettendorf, Iowa

FOR SALE: Orenco Light Transport, a strictly modern 5-place commercial airplane, side-by-side dual in rear cockpit. High speed, 110 m.p.h., landing 40, ceiling 19,000, gas capacity 85 gals., price complete with 180 Hisso and Reed propeller $3,500. Good Jenny $800, Standard fuselage with undercarriage $125, Two OX crankcases $10 each, Jenny and Canuck control surfaces $5 each. OX, Hisso, and Liberty motor work at moderate prices.
ROOSEVELT AERO SERVICE
WESTBURY, LONG ISLAND, N. Y.

We Specialize in Simple and Alloy Steels to U. S. Government Specifications.
Most grades are carried regularly in our warehouse.
Hot and cold rolled bars and strips.
THE DICKERSON STEEL COMPANY
DAYTON, OHIO.

BARGAINS

New 26 x 4 tires	$ 3.25
New Curtiss K-6 Motor	1500.00
New Curtiss C-6A Motor	2300.00

We have many other bargains in airplanes, motors, and parts.
Before buying get our quotations.
IRELAND AIRCRAFT, Inc.
Curtiss Field, Garden City, N. Y.

Special Eaglerock Course of 5 Hours, $60.00
this offer good until March 1, 1927
NO EXTRA CHARGES
1 T.M. Scout duals, price $400.00.
1 Laird Swallow, good covering, duals, $800.00.
1 Hisso 5-place Standard, $1000.00.
Storage for 5 planes. *We operate Richards Field.*
BENNETT EAGLEROCK SALES CO.
223 West 12th Street, Kansas City, Mo.

THE AEROPLANE
PUBLISHED WEEKLY
175, PICCADILLY, LONDON, W.1, ENGLAND
CHARLES GREY, EDITOR
Subscription Rates for U.S.A. 1 year—$8.50

KREIDER-REISNER AIRCRAFT CO., INC.
Waco Nine Distributors
FOR SALE: Berkman Scout (less motor) $150; Jennie $700; Canuck (new) $1,000; used Waco Nines from $1,650. up.
HAGERSTOWN MARYLAND

WILLIAM E. ARTHUR & CO., INC.
103 PARK AVE., NEW YORK CITY
Engineers and Builders
HANGARS — AIRPORTS — FLYING FIELDS, DRAINAGE, LIGHTING SYSTEMS, EQUIPMENT, ETC.
A SATISFIED CLIENT OUR MOTTO.

AIRCRAFT SERVICE DIRECTORY
CONTINUED

HARTZELL PROPELLERS ARE RELIABLE
BUILT ON HONOR — THEY ARE GIVING EFFICIENT SERVICE ON ALL CLASSES OF MILITARY AND COMMERCIAL AIRPLANES
New OX Walnut Propellers for Quick Shipment
Contractors to U. S. Government and Commercial Manufacturers
HARTZELL WALNUT PROPELLER CO.
PIQUA, OHIO

THE AIRCRAFT SERVICE DIRECTORY
Brings You Into Weekly Contact With
THE ENTIRE AERONAUTICAL INDUSTRY

POSITION OPEN AS SALES ENGINEER
Outdoor floodlighting and special illuminating equipment. The position requires sales experience and ability to interview executive heads of large industrial companies. Traveling is necessary. Headquarters New York. This position will also offer the opportunity of later becoming connected with our Aviation Equipment Sales Department. State age, experience and full information first letter. Also if you would be qualified to travel by airplane. Box 522, AVIATION.

DECATUR AIRCRAFT COMPANY
DECATUR, ILLINOIS.
New and Used Ships for Sale
Parts for JN4D-JN4C or Standard J1 Ships
OX5-OXX6-Hisso or Liberty Motors
Complete Flying Course—$150.00
Write for our new catalog

Place Your Product Before the Industry by Advertising in The Directory

THE DETROIT AERO MOTORS CO.
10331 CHARLEVOIX AVE., DETROIT, MICH.
One 60 H.P. six cylinder radial motor, Price $250.00. One new 220 Hispano, Price $350.00. One OXX6, New, Price $450.00. One OXX6, used, Price $275.00. One Hall-Scott four cylinder, Price $75.00. D-81 Berling Mags, Price $13.50. Liberty 12 Beacolite Distributor Heads each, Price $4.00.

Before you try to fly a ship, learn the basic principles of flying
under the direction of Stuart Finch, formerly with U. S. Government, Inspector of Airplanes and Airplane Engines S.S.L.
Send 25c. for interesting booklet.
FINCH AIRCRAFT CO., 1221 West 7th St.
Los Angeles, California
Designers and constructors of aircraft. Inventions developed.

The Aeroplane
Published Weekly
175, Piccadilly, London, W.1
England
CHARLES GREY
Editor
Subscription Rates for U.S.A.
1 year—$8.50

DOPES
PIGMENTED DOPES
VARNISHES ENAMELS
TITANINE
MADE BY
TITANINE, Inc.
UNION, UNION COUNTY, N. J.
Contractors to U. S. Government

PLYWOOD
Water Resistant Panels
Made According to
Government Specifications
Any Size or Thickness
New Jersey Veneer Co.
Paterson, N. J., U.S.A.

AIRMEN AND THOUSANDS WHO COMPREHEND THE MEANING OF AERONAUTIC PROGRESS LOOK TO

The Oldest American Aircraft Publication

AVIATION

The Only American Aircraft Weekly

For Current and Accurate Information on These Vital Aviation Questions—

Will the development of flying be retarded or promoted by the regulations now being formulated by the Department of Commerce under the Air Commerce Act of 1926, covering the inspection and licensing of aircraft engaged in interstate commerce, and the licensing of pilots of such aircraft?

Will the Congress appropriate the necessary money to carry out the five-year aircraft construction programs for the Army and Navy authorized at the previous session?

What is being done to make air transportation a profitable investment?

Are the more than 9,000 miles of air mail routes proving their commercial worth?

What is being done to increase the reliability of aircraft engines and the safety of aircraft?

Between what cities are new airlines being established and by whom?

What is the Department of Commerce doing under the Air Commerce Act of 1926, to encourage and foster commercial flying and air transport?

What are the necessary steps to secure a municipal airport? How should it be constructed? With what should it be equipped?

What is going on each week in the aircraft factories, on the airlines, at the airports?

What are the characteristics and specifications of the new planes and engines, both military and commercial, which the demands of speed and reliability are bringing forth?

What are the latest approved aircraft equipment, parts and materials? By whom produced?

Who are the purchasers of airplanes for pleasure or commercial purposes?

In what new ways are airplanes proving their commercial utility?

How and with whom are the Government air services—the Army Air Corps, Naval Aviation and Post Office Air Mail—spending the large aeronautical appropriations toward which you contribute as a tax payer?

What are the outstanding aeronautic events of the week?

What opportunities does the aircraft field offer to the business or professional man and the younger generation?

Where can new or used planes, engines, parts, equipment, material or supplies be purchased?

Where can flight, ground, mechanical or engineering training be secured?

By what organizations or individuals and with what equipment is aeronautical history being made?

In illustrations and text AVIATION gives in weekly issues the latest information on many of these subjects. A year's reading of AVIATION—52 issues—will give you a broad aeronautical education, a correct perspective of present and future development.

If you are interested in the great industrial development of aircraft either as a spectator or a worker

You Will Find Aviation the Indispensible Aircraft Publication.

Take advantage of the special offer outlined in the coupon and mail your subscription now.

FOUR DOLLARS IN THE UNITED STATES

CANADA $5.00
OTHER COUNTRIES $6.00

AVIATION — 225 Fourth Avenue, New York

AVIATION
225 Fourth Avenue, New York

Please enter my subscription to AVIATION, with the understanding that if, after reading the first four numbers, I wish to discontinue, you will refund the enclosed $. without further obligation on my part.

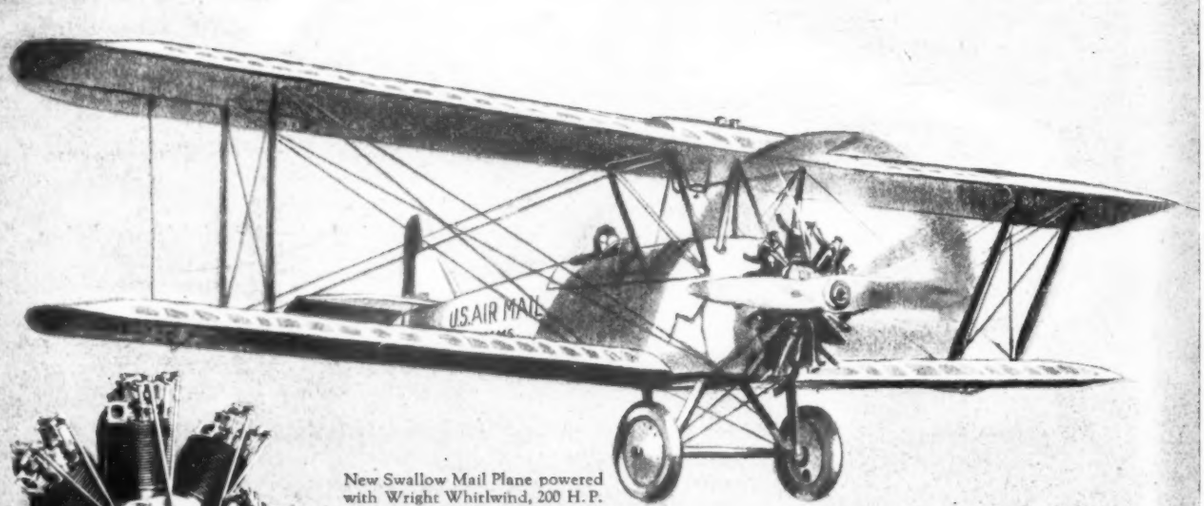
_____ _____

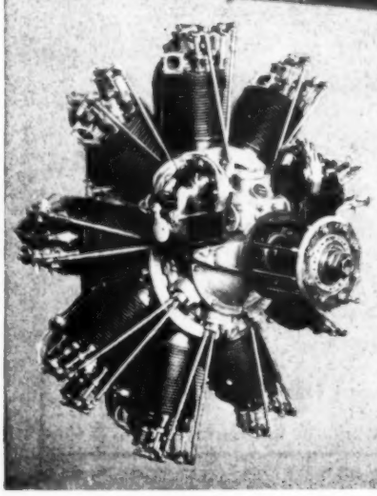
More Pilots Know More About

WRIGHT WHIRLWIND ENGINES

than any other Aeronautical Engine now manufactured in America

That's why More Pilots fly them!





New Swallow Mail Plane powered with Wright Whirlwind, 200 H.P. Engine. Built by Swallow Airplane and Manufacturing Company, Wichita, Kansas. Original water-cooled engines on these planes were replaced with Wright Whirlwinds to give sufficient reserve power and performance at altitude for Varney air mail route between Pasco, Washington and Elko, Nevada.

Send for Bulletin No. 8.

WRIGHT

WRIGHT AERONAUTICAL CORPORATION

Paterson, N. J., U. S. A.